

The Doncaster Naturalist

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Don Gorge Special Edition

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Cover photo: A view from the Conisbrough Viaduct, showing Cadeby Quarry at the left and the Levitt Hagg landfill site at top right. *J.Simmons*

The drawing of Bird’s-foot Trefoil, used throughout, is by Elizabeth Farningham

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Ice age mammals in the Don Gorge, Doncaster: A tribute to Edward Bennett Jenkinson FGS (1838-1878)

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The discovery of the remains of prehistoric creatures usually triggers a flurry of media interest, ignites the public imagination and launches scientists into programmes of research. It also prompts government agencies to confer statutory scientific and heritage designations and in the long term, encourages local authorities and entrepreneurs to develop tourist and interpretative facilities. This has been true of the cave sites at Buckfastleigh in South Devon, the Cheddar Gorge, the Mendips, the Derbyshire Peak District, the Pennine Dales and (just down the road from here) at Creswell Crags near Worksop. With the Permian limestone region between Conisbrough (SK/5098), Cadeby (SK/5199), Warmsworth (SE/5300) and Sprotbrough (SE/5301) being riddled with tunnels, potholes, fissures, rock shelters and having more historic monuments, sites of industrial archaeology and statutory and second tier sites of natural or geological interest than you can shake a stick at (see Ellis 1988), it is high time that our own Don Gorge should share in this same national celebrity.

This note draws attention to the scatter of little known discoveries of palaeolithic bone material from the Don Gorge in the hope that it may highlight a) the need for research on the many exposed but vulnerable Pleistocene/Palaeolithic deposits and b) the possibilities of making further important cultural and scientific discoveries to the benefit of the region.

In the 1870s the series of reservoirs at Firsby (SK/4995), Ravenfield (SK/4895) and Thrybergh (SK/4795) [all now within the Rotherham Metropolitan Borough] were being developed by the Doncaster Water Company to provide Doncaster with its first safe (non-river) public water supply. In order to conduct this supply to the town, an elaborate series of tunnels was constructed to take the network of large-bore cast iron water pipes. In 1878, while undertaking the epic work of tunnelling through the fractured and fissured Magnesian limestone strata in the Don Gorge between Conisbrough and Warmsworth, the engineers broke into a 'marl-filled fissure' and encountered a cache of impressively

large fossil bones. These were purchased by the local geologist Edward Bennett Jenkinson FGS, who passed them for identification and comment to Professor William Boyd Dawkins (1837-1927), the doyen of cave research. The specific find site is not known but it's description suggests it to be along the pipe tunnel which runs from Nearcliffe Wood (SK/525991), deep underground emerging near the covered reservoir adjacent to Warmsworth Halt (SK/541999).

The story was taken up by the press as follows:

Doncaster Chronicle 5 July 1878 'Interesting Discovery'

"A discovery of ossiferous remains of animals of the Pleistocene age has just been made in the limestone crags at Conisbrough. The workmen engaged in excavating the cutting for the piles in connection with the Doncaster Water Works came upon several fossil bones of unusual size. Some of these passed into the hands of one of the men employed on the works who kept them as a "wonderful find", but was ignorant of their true character. Information of the discovery reaching the ears of Mr. E.B. Jenkinson, F.G.S., of Swinton, that gentleman purchased them and others afterwards obtained, and sent to Professor Boyd Dawkins of Owen College, Manchester [now Manchester University] for identification. That gentleman being a distinguished palaeontologist and noted cave hunter, identified them as the bones of the Elephas or Mammoth *Mammuthus primigenius*, Rhinoceros tichornus *Coelodonta antiquitatis* (woolly rhinoceros), and the wild horse *Equus ferus*; and also that some of the bones had been gnawed by Hyaenas. To those versed in geological facts, the discovery of relicts of mammals utterly extinct now in Great Britain, is not a matter of wonder; for at Robin Hood's Cave in Creswell Crags, Nottinghamshire, and at Wookey Hole near Wells, Somerset, and at Kirkdale, Yorkshire, the remains of the elephant, rhinoceros, hyaena and other animals have been found in large quantities ... The bones found in the rocks at Conisbrough are the femur, the radius, the tibia and the shaft of the humerus of the woolly rhinoceros; the metacarpal of the horse; and the tibia of elephas (probably mammoth) ..."

This find put the Don Gorge on the academic map and in August and September of that year Edward Jenkinson conducted groups from the University Students' Association on rambles to see the geological sites of the area. This was a particularly interesting period in the history of geological research since the history and formation of the Magnesian limestone was in the process of being worked out for the first time. Whether this rare and curious form of limestone was derived from chemical precipitation or by the deposition of prehistoric marine life was being hotly debated.

Accounts of the excursions were reported in detail by the press as follows:

Doncaster Chronicle 9th August 1878 'A Scientific Pic-nic'

"On Saturday afternoon members of the University Students' Association paid a visit to Conisbrough and the neighbourhood for the purpose of studying the "Permian" strata. At Mexborough they were met by Edward G. [B.] Jenkinson Esq., F.G.S., who kindly promised to accompany the students and assist in their investigations. The party at once proceeded to Andetron's tea gardens where an excellent tea had been provided.



Edward Bennett Jenkinson FGS
(1838-1878)

Portrait supplied by his great, great,
grand-daughter Mrs F.V. Proud.

It was originally intended to have the tea at the gardens but as rain had fallen heavily in the morning, Mr. Anderton accommodated the students undercover, the tables being ornamented by a variety of bouquets. After enjoying a social meal and studying the geological maps of the neighbourhood, Mr Jenkinson exhibited some bones discovered in the neighbourhood, proving the existence of at least three extinct species of mammals they were the femur of a *Rhinoceros tichornus*, the tibia of an *Elephas primogenius*, both now extinct and the metacarpal of a Horse. In these bones the teeth marks of *Hyaenas* were distinctly visible, the animals having been dragged into the cave of the *hyaena* and there gnawed.

After first visiting the castle the party passed into the Don gorge where the culvert now in course of construction to Ravenfield was reached. Here, through the crevices of the limestone the lower red marl had been washed, a tongue of the marl running up to within a short distance. On the sides of the culvert numerous cases of stalagmatic action were seen. Here an admirable paper descriptive of the physical geology of the neighbourhood was read by Mr Jenkinson, the gentleman having evidently paid considerable attention to the "Permian". A unanimous vote of thanks was given to the reader, coupled with the wish to that a larger party had been present; several of the associates expressed the opinion that the absentees had missed a great treat. Passing along the secluded but lovely walk along the valley of the Don, Warmsworth Quarry was reached; here was a rich field for geological investigation. The quarry is worked in what is known as the Lower Magnesian limestone; there are two hypotheses to account for its origins, the one being chemical and the other the organic theory, probably both are correct ... It is from the unfossiliferous character that the strongest support for the chemical theory is derived but the students

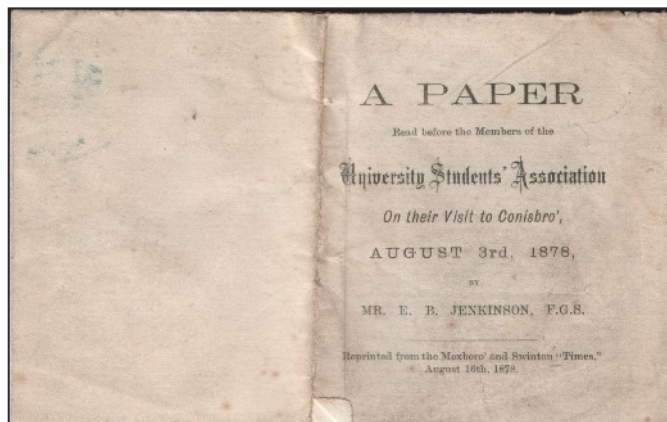


Figure 2. Frontispiece of E.B. Jenkinson's paper given on 3 August 1878. Photo provided by Mrs F.V. Proud.

set earnestly to work, hammers and lenses were requisitioned, with the result of discovering that organic nature had something to do with the formation of the lofty cliffs at the base of which they were working. One specimen in the possession of the writer is clearly made of organic debris, one shell of "Globigerina" being entire, the foramina being distinctly visible under a good power. One piece was found which was believed to contain the joints of a Crinoid; this is now in the possession of Mr Jenkinson, who will doubtless submit it to further examination. Mr Wood was fortunate in securing a small specimen containing a small portion of the vertebra of a fish. This was a doubtful specimen but not at all improbable as Gadoid fish are common in this stratum in the North of England.

Taking a last look at the lovely secluded valley of the Don, the party returned to Conisbrough discoursing most learnedly on the way, again visiting Mr Anderton's to gather up cloaks and coats left behind ... At Swinton Mr Jenkinson left the party, who hoped soon to again have the pleasure of his company as conducteur..."

Doncaster Chronicle 5 September 1878 'Excursion to Conisbrough'

"On Saturday afternoon a party of the University Students Association visited the pretty village for the purpose of exploring the Permian rocks so profusely found in its immediate neighbourhood.

The first object of interest was the upper coal measures found in the neighbourhood of Doncaster road. This spot is rendered more interesting as it is the only place in Yorkshire where the upper coal is found, the whole of the formation with this exception has been removed by denudation and erosion probably before the deposition of the red marl resting unconformably upon it.

The keep of the old castle was next visited, a portion of the party ascending to the summit and admiring the beauty of the panorama spread beneath them.

After enjoying a hearty tea the business of the Association was proceeded with. The party inspected the quarry being worked in the Dolomitic limestone capped by red marl (a distinguishing feature of this formation). The idea of the Magnesian limestone being the result of an inland sea was discussed and several pieces of the rock were secured

for future inspection and analysis. This sea must have been filled with animals of a low type of organisation, portions of the rock being literally composed of “Globulina” and other minute creatures belonging to the order Ostracoda. Some specimens were found in which the shells of the lamellibranchiate (*Arca antiqua?*) were abundant. The position occupied by the remains shows that they were slowly deposited on a sea bottom undisturbed by currents. The party returned home much gratified and instructed by their excursion.”

More “Pleistocene Mammalian Remains near Doncaster”

In 1906, during the excavation of the very deep ravine through the limestone of Nearcliff Wood to accommodate the Dearne Valley mineral line from the Cadeby viaduct through to Edlington, a further discovery of Pleistocene bone material was encountered. This was reported on by Dr Henry Herbert Corbett in the Yorkshire Naturalists’ Union journal *The Naturalist* (Corbett 1906). Dr Corbett was a celebrated Doncaster GP, founder of the Doncaster Microscopical and General Scientific Society and was later (in 1910) to become Doncaster Museum’s first Honorary Curator.

“In excavating for a deep cutting on the Dearne Valley Railway near Conisbro’ [SK/5299] some fragments of bone were thrown out by the steam navvy. These were taken to the office of the resident engineer, Mr. Gibbs and were kindly given by him to me. They consisted of part of an antler, probably *Cervus elephas* and two bones of *Rhinoceros*. These latter have been submitted for identification to Mr. T. Sheppard [of Hull Museums] and by him to the British Museum Authorities. Close to the place where the bones were found is a cave in the Magnesian Limestone and it is hoped that when this is further opened up, more bones etc. may be found. Mr Gibbs has given orders that anything of interest discovered is to be handed over to me for our local museum. H.H. Corbett, M.R.C.S., Doncaster”.

An editorial footnote by Thomas Sheppard noted that “These are the ulna and tibia and one of them is distinctly gnawed, apparently by hyenas. It is to be hoped that further researches will result in as interesting a set of specimens being found as occurred in then Creswell Caves, which were also in the Magnesian Limestone. T.S.”

Interestingly, this railway cutting is directly above the water pipe tunnel, which suggests the possibility that the 1878 and 1906 finds may be connected. Sadly, however, enquiries at museums at Doncaster, Leeds, Manchester, Sheffield, South Kensington or York have so far failed to trace the whereabouts of any of these specimens.

It seems evident that Mr Gibbs’ did indeed pass further bone finds to Dr Corbett, for in Doncaster Museum’s Geology Stock Book and listed in Dr Corbett’s hand, are the following entries:

Table 1. Items listed in Doncaster Museum Geology Stock Book

<i>Rangifer</i> . Reindeer	Warmsworth	Gift	Dr. H.H. Corbett
Femur or thighbone of <i>Rhinoceros</i>	Nr. Conisbro’	Gift	Dr. H.H. Corbett
Jaw bones of <i>Bos primigenius</i>	Loversall		
Horn core of <i>Bos primigenius</i>	Loversall		

It is likely that the remains (unspecified) of Reindeer and the femur of the Rhinoceros are as yet unpublished. The Aurochs *Bos primigenius* horn core however is likely to be that exhibited by Dr Corbett at the Doncaster Scientific Society meeting on 13 March 1907 (see DNS Minute book) and subsequently published in *The Naturalist* (Corbett 1907). The horn core and jaw bones would therefore have been encountered during the eastward extension of the South Yorkshire Joint Railway line in 1907.

It is also worth noting that other (possibly many), Ice age and post-glacial (Pleistocene, Holocene and Palaeolithic) sites are just sitting there, waiting to be identified, studied and to receive appropriate recognition. Ironically, although the Don Gorge missed out on the Victorian cave hunting bonanza and the tourist industry that came in its wake, it also avoided the crude and damaging ‘treasure-seeking’ practices of the dilettante ‘gentlemen geologists’ of the mid 19th century. The material and sites that remain are likely to be in a relatively undisturbed condition and could therefore benefit from the far more revealing investigative and dating techniques of modern archaeology and geophysics.

Though many of the Ice age sites which would have occurred in the Don Gorge have gone through a history of quarrying, current mineral planning legislation enables local and national government authorities to be more prescriptive of mitigation actions and after-use. So for the future, the extensive and relatively unexplored Don Gorge which bisects the Magnesian limestone ridge just 25 km to the north of the internationally renowned Creswell Crags, has the potential for instigating a new era of archaeological, geological and palaeo-ecological investigation, and in turn developing the welcome basis of educational, cultural, recreational and tourism promotion within the region.

The Trail Goes Cold

The passage of time, two World Wars and landscape despoliation by Coal mining and Limestone quarrying have removed much of the evidence and all memories of the former natural beauties and scientific significance of the Don Gorge from the local consciousness. In the late 20th century the Gorge developed a notoriety as a graveyard for crashed and burnt-out stolen cars, as a Mecca for illegal scramble biking and for landfill sites ... a far cry from special railway excursions bringing tourists to enjoy the spring flowers.

Tragically, Edward Jenkinson died of Typhoid in the November of the year of his scientific discoveries. Had he been able to publish his findings in the main-stream scientific literature and to further pursue his investigations, one wonders whether the Don Gorge would have attracted the international celebrity of say Creswell Crags.

The long forgotten discoveries of Jenkinson and Corbett were highlighted in Howes (2005 & 2006) which led to an investigation of the archaeological potential of 22 cave and fissure sites and exposures in Nearcliff Quarres, Conisbrough (Davies 2007) and formed the basis of Palaeolithic bone finds mentioned in Bevan (2007). Since 2006 the DMBC, through its partners in the ‘Don Gorge Strategic Partnership’, and initiatives such as ‘Discovering the Ancient Don Gorge’ and the ‘Sprotborough Heritage, Access and Restoration Project’, there has been massive progress in giving the area a positive image and highlighting its scientific significance and natural beauties.

Acknowledgement

Particular thanks are due to Mrs F.V. Proud for providing the portraits of her great, great grandfather and a photocopy of Edward Jenkinson's lecture manuscript of 3rd August 1878. Thanks are due to Doncaster Museum for access to the geological collections and documentation, also to the Doncaster Naturalists' Society for access to their extensive archives. Roy Sykes (Minerals Planning officer of DMBC Planning Department) provided access to Davies (2007). This study has formed the basis of a poster display exhibited at Conisbrough Library, Warmsworth Library in 2007 and at meetings of the Doncaster Naturalists' Society and the History section of the Yorkshire Naturalists' Union.

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Notes on the 'threshold faunas' of caves and tunnels within the Magnesian Limestone of the Don Gorge, Doncaster

Colin A. Howes

Introduction

The Don Gorge, which slices through southern Yorkshire's Magnesian limestone ridge, from Conisbrough and Cadeby in the west to Sprotbrough and Warmsworth in the east, contains a considerable number of subterranean sites that harbour specialist assemblages of organisms referred to in the speleological literature as 'threshold faunas'.

Sites are of a wide range of types including potholes and fissures up to 88 metres in length, two major railway tunnels each in excess of 250 metres long, a water pipe tunnel over 1 kilometre in length with some four vertical air shafts, some thirteen quarry 'tramway' tunnels and two railway arch tunnels up to 42 metres in length, which run beneath the massive limestone embankment of the main Doncaster to Sheffield railway line, and a number of disused hearths and flues of 18th and 19th century limekilns. The natural voids and fissures constitute features known to geologists and speleologists as 'mass movement' structures and the various forms of tunnels, being man-made, are probably more correctly termed 'hypogea'.

Though 'walk-in show caves' in the sense of those at nearby Creswell Crags on the Nottinghamshire - Derbyshire border are no longer a feature of the Don Gorge, perhaps removed if they ever existed by a history of quarrying dating back to Roman Doncaster and Norman Conisbrough, many subterranean sites of significance still survive. Rock shelters and Pleistocene fissure deposits which have produced deer and hyena-gnawed rhinoceros bones (Corbett 1906) are still present and are as yet totally un-researched, indeed, additional examples have been revealed by quarrying, tunnelling and the excavation of deep railway cuttings.

With such a high concentration and diversity of subterranean sites, including some 23% of Yorkshire's Magnesian Limestone caves (Gibson et. al. 1976, Brooks et. al. 1988), the Don Gorge is probably unique in lowland eastern England and justifies becoming a major focus of interest within the southern Magnesian Limestone natural area. The purpose of this account is to draw attention to the on-going studies on the Don Gorge and to highlight the area's considerable conservation value and potential as a laboratory for subterranean ecological and palaeontological studies.

What is the 'Threshold Environment'?

Whilst not experiencing the peculiarly constant or uniform environmental conditions typical of classic deep cave systems, conditions in the Don Gorge subterranean sites are substantially more buffered and stable than in above ground or 'epigean' situations. The 'threshold environment' is unique in harbouring elements of both above-ground (epigean) and subterranean (hypogean) plants and animals which can be examined at the extreme ranges of their environmental tolerance.

Paradoxically the significant characteristic of these rare and isolated situations is not their environmental stability but the ecological tensions caused by the steep gradients

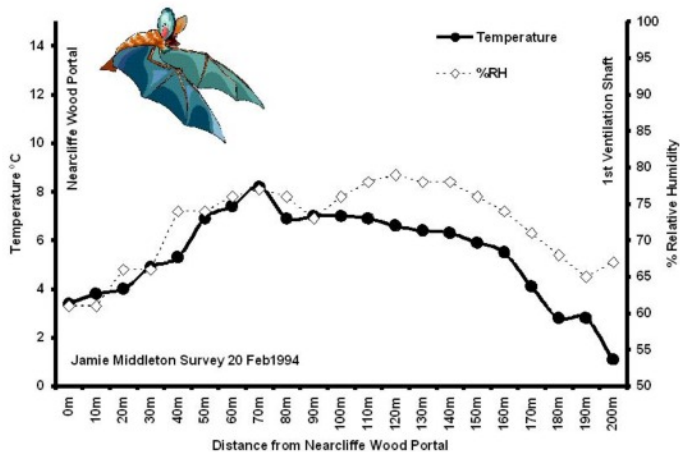


Figure 1: Variations in temperature ($^{\circ}\text{C}$) and % Relative Humidity along the first section of the Nearcliffe Wood ‘Pipe Tunnel’ from a survey undertaken by Jamie Middleton on 20 February 1994.

of light, temperature and humidity between highly volatile epigeal environment of the outside world and the relatively buffered and stable hypogean domain. Figure 1, based on a series of temperature and % relative humidity readings taken at 10m intervals on a chilly February day along the Nearcliffe Wood Pipe Tunnel from its woodland entrance to the base of the first air shaft. This shows the temperature rising from 3.4°C at the entrance to 8.2°C at its warmest point 70m in. Interestingly the temperature then declined to a minimum of 1.1°C in the cold sump at the base of the first ventilation shaft.

Furthermore, these gradients are not constant but oscillate markedly according to daily and seasonal cycles, and indeed in the cases of temperature and humidity, can reverse in direction.

Light intensity declines significantly with distance from the cave or tunnel portal but the gradient virtually disappears at night. A fascinating example of how ferns and mosses are affected by diminishing light levels can be seen in the photograph in Figure 2 looking up one of the Nearcliffe Air shafts where the mosses give way to a circular coronet of hart’s tongue ferns around the skyward portal. Temperatures vary with distance from the portal, increasing in the winter (see Fig. 1) and decreasing in summertime, the steepness of the thermal gradient varying in accordance with the extremes of external temperatures.

Subterranean sites in the Don Gorge can also influence adjacent ‘above ground’ micro-habitats. During very hot humid summer days, relatively much cooler air emerging from the Nearcliffe Wood water pipe tunnel (SK/526992) and confined within a deep limestone ravine, condenses into a thick chill fog, creating constantly damp conditions which suits the dominant lush growths of bryophytes and ferns, notably the Hartstongue Fern *Phyllitis scolopendrium*. Although, probably similar to bryophyte (moss) and pteridophyte (fern) communities at the mouths of a spring or adjacent to water falls, this ‘condensa-

tion' community is independent of spring, stream or river and forms a highly localised phenomenon within a relatively dry, lowland rain-shadow region of Yorkshire. During still frosty conditions in winter, relatively warm moist air rising from the upper entrance of the Nearcliff Wood Rift (SK/527995) condenses into a plume of mist which, under appropriate conditions, gives rise to sparkling icicles on surrounding rocks and shrubs. This cave is known locally as the 'Dragon's cave' due to the emergence of steam in frosty weather.

Recent studies on the 'threshold faunas'

Since 1990 members of the Don Gorge Bat Study Group have made regular visits to these sites in search of winter hibernation and summer nursery and roosting sites for bats. Examples of the invertebrate fauna have been collected or noted and there has been significant monitoring of temperature and relative humidity regimes (Howes 1996).

Invertebrates (Spiders, Butterflies and Moths are dealt with in separate articles)

Flies (Diptera) By far the most frequent dipteran (fly) is the mosquito *Culex pipiens*, large numbers of females, are encountered in dense 'roosts' particularly in the damper areas at the rear of blocked off tunnels or on wet surfaces within caves in autumn and winter. 283 were counted on 1 square foot of a wet and glistening flowstone boulder at the rear of a tramway tunnel on 8th February 1998 (H. Kirk and P. Seccombe pers. comm.). Evidently the inseminated females of the autumn generation of the 'rural race' of *C. pipiens* move into subterranean sites from about September to April to hibernate and undergo an ovarian diapause. On emergence they take a blood meal and lay egg rafts on the surface of still water. The next two or three generations through the summer are able to reproduce without a diapause or recoure to caves (Jefferson 1983).

The crane-fly *Limonia nubeculosa* is regularly encountered in small numbers during the summer months within the first 20 metres in the north-facing tramway tunnels between Levitt Hagg wood and Farcliff Wood.

Small numbers of the Heleomyzid fly *Heleomyza serrata* have been found in winter near the 1st air shaft in the Nearcliff Wood tunnel. Other local sites on the magnesian limestone are at Bilham Quarry and Cusworth Park. It is known to occur underground throughout the year, copulation has been observed and populations occur far beyond the 'threshold' zone (Jefferson 1983). Their larvae feed fungi, plant and animal matter.

An empty puparium of a bat fly Nycteribiidae, probably *Nycteribia kolenatii* was encountered in a stonework ventilation tunnel of the 19th century lime kiln at Levitt Hagg (Howes 1996). This rarely recorded wingless spider-like ectoparasite is usually (probably exclusively) associated with Daubenton's Bats (Howes and Skidmore 1993), roosts and hibernacula of which have so far been located in eight subterranean sites in the Don Gorge. Unlike other members of the cave fauna, the conditions afforded by the 'threshold' environment are secondary to the presence of the host species.

The drone fly *Eristalis tenax* is encountered hibernating in winter, singly or in groups of up to five wedged tightly into crevices between stonework usually at or within the first 10 meters of the north facing tunnel entrances. Although they endure humidity regimes ranging from 66% to 93% Rh., they seem to prefer relatively dryer sites than other 'threshold' occupants, the mean of measurements taken at the locations of 15 individuals

being 79.6%. Active specimens can typically be seen feeding on nectar from Ivy flowers in the autumn prior to hibernation and freshly emerged specimens feed on grey willow *Salix cinerea* flowers in April.



Drone fly (a hoverfly) *Eristalis tenax* photographed in one of the tunnels. *L.Hill*

Isopoda (Woodlice) and Diplopoda (Millipedes) appear to be subject to a humidity and light dependent zonation with *Procellio scaber* under the dryer limestone rubble and stonework at tunnel and cave entrances and in dry situations under masonry associated with the disused limekilns. *Philoscia muscorum*, abundant in the vegetation and humus surrounding the tunnel or cave portals, tends not to extend beyond the zone where vascular plants are shaded out. Pill Millipedes *Glomeris marginata* occasionally visit the walls of the damper tunnel entrances and *Oniscus asellus* frequently enter the damper tunnels though seldom venturing much beyond the zone where light is insufficient to support algal growth. By contrast, the so called Rosey Woodlouse *Androniscus dentiger* is capable of existing well beyond this, in areas of total darkness.

Both Snake Millipedes *Cylindroiulus* sp. and the Flat-backed Millipedes *Polydesmus* sp. occur in the wetter zones of tunnel sites, examples having been trapped in the webs of the Cave Spider *Meta menardi*.

Vertebrates

At least five species of bat have been shown to use the sites for winter hibernation, summer breeding, roosting and as feeding perches. An analysis of our records show that positively identified and often handled bats have been recorded from some fourteen sites. Five sites are used by one species, six sites by two species, one of the tramway tunnels has three species and one tramway tunnel and the Nearcliff water pipe tunnel have been used by four species. A further five sites, mainly rock fissures and pot holes are used by bats on evidence of their droppings. Whiskered Bat is known from three sites, Natterer's Bat at seven sites, Daubenton's Bat at eight sites and Brown Long-eared Bat in eleven sites.

The extraordinary spectacle of the entire silt and loam-covered floor of a 20 metre long tramway tunnel being overturned by Mole activity was encountered in August 1998. Flood water to a depth in excess of 1 metre had flushed considerable volumes of humus and organic debris from the adjacent steep woodland floor into the tunnel. This evidently periodic phenomenon has over time produced a deep moist humus soil which is opportunistically worked for invertebrates by local moles.

Footprints in water-deposited silt, indicated that Brown Rats visited those Don-side tramway and railway bridge tunnels which are regularly inundated, in search of edible river flood debris.

The nest of a Wren was located in February 1998 below ground level and in darkness inside the derelict hearth of a disused 19th century limekiln.

Thanks are due to Tony Lane and members of the Don Gorge Bat Study Group, particularly Derek Allen, Louise Hill, Tim Prosser, Helen Kirk, Pip and Tim Seccombe for their unflagging assistance over the years.

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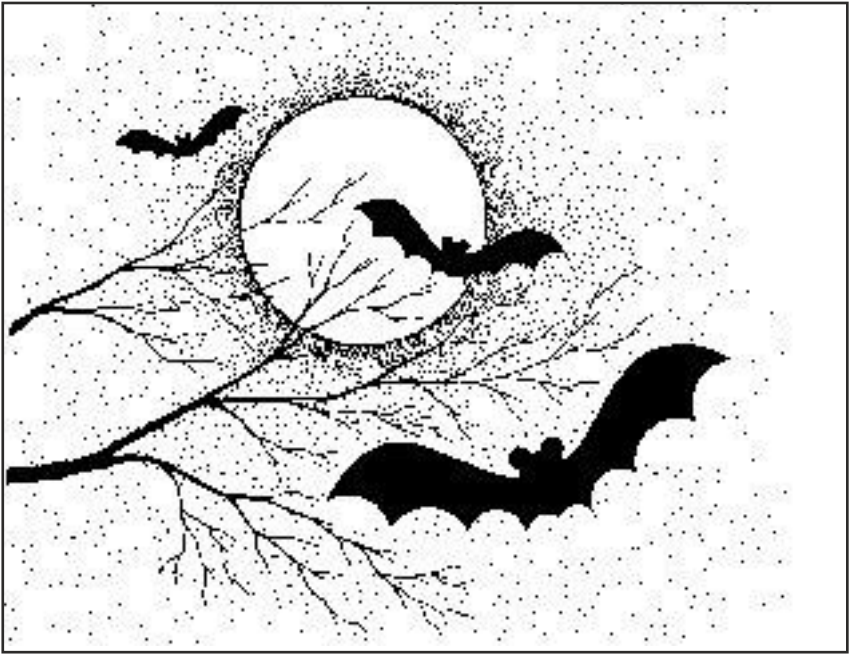
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Bat studies in the Don Gorge 1990-2012:

The first twenty-three years

Tony Lane, Colin Howes, Pip Secombe, Louise Hill and Derek Allen

Introduction

After dusk on summer evenings the woodland ridings and riverside walks along the Don Gorge are alive with bat activity. Visitors to the Boat Inn area encounter Pipistrelle bats from local properties hunting insects around the street lights of Boat Lane and Nursery Lane. Daubenton's Bats hunt low over the waters below the Sprotbrough Falls and around Sprotbrough Lock and larger Noctule bats indulge in spectacular aerobatics as they hunt large nocturnal insects over the wetlands of Sprotbrough Flash. Apart from knowing of a Whiskered Bat nursery roost in the outbuildings of the Boat Inn and that a few Pipistrelle bat nursery roosts are in domestic properties in Sprotborough Village and Park, very little monitoring of bats has been undertaken during the summer months and much new and interesting work remains to be done.

The greatest effort of the Don Gorge Bat Group and its numerous friends from Bat and Caving Groups from around the north of England (see acknowledgements) has taken place in the depths of winter, examining the area's numerous tunnels, fissures and caves. If getting thoroughly cold, wet, filthy and exhausted appeals, this is the pastime for you! But here, with expert and licensed guidance, you will find the hibernation sites of Brandt's Bat, Whiskered Bat, Daubenton's Bat, Natterer's Bat and Brown Long-eared Bat.

Conservation dividend

Threats to subterranean sites and their highly specialist and localised faunas in the Don Gorge are considerable and relentless. In the few years since these studies were instigated, our survey evidence has been mobilised in defence of most of the bat-sites we've discovered. Most negative developments have so far been halted or modified, enabling the bats to remain.

One of the first success stories was brought about by Frank Devine in making it necessary for the developers of the Levitt Hagg Landfill site to safely exclude the bats occupying the shattered cliff face prior to its being blasted into its present landform. This work was undertaken by the national bat expert Dr Bob Stebbings. Similarly the infilling of most of the tramway tunnels beneath the Doncaster/Sheffield railway was avoided in the nick of time with the loss of only one tunnel. The celebrated 'water pipe' tunnel from Nearcliffe Wood through to Warmsworth, destined to be blocked at each end had this engineering solution commuted to having bat-friendly grills installed and the tunnel owners (Yorkshire Water) now recognise the legislative significance of this bat site. The concreting over of the rock fissures either side of the Dearne Valley railway ravine beneath the A630 Doncaster/Conisbrough road, was mitigated for by the building of an artificial bat hibernaculum.

The Railway legacy



Since the mid 19th century some six railway lines have passed along or across the Gorge giving rise to bridges, tunnels, deep cuttings and steep embankments, all (in their dereliction) directly or indirectly creating a range of potential bat roosting sites.

Tramway tunnels: When in 1849 the Doncaster/Sheffield railway line was built through the Don Gorge from Conisbrough to Levitt Hagg, thirteen tunnels had to be constructed beneath the extensive embankment to re-connect the series of huge limestone

quarries (principally Warmsworth Quarry and Farcliffe Quarry on the south side of the Don) with access to loading wharves on the river Don/South Yorkshire Navigation and to bank-side limestone kilns. Two additional tunnels are beneath the brick structure of the 'Rainbow Bridge' which crosses the Don opposite Nearcliffe Quarry. With access to the quarries now being made by vehicular haul roads from the Doncaster/Conisbrough A630, most of the pedestrian or tramway tunnels are now redundant. To prevent unauthorised access to working quarries, some of the tunnels have now been blocked by limestone rubble at the quarry end. These now effectively function as short, north-west facing, caves up to 42m in length. They are of a stone and brick construction with stone up to 'shoulder' height, topped by a brick arch roof. In some cases, tunnels have a section of a slightly greater width at the rear. Thus, at the junction of two widths there is a joint/ledge shielded from daylight and therefore highly suitable for bats and cave spiders.

Railway tunnels: Of the railway tunnels, both on the north side of the gorge, the longest, carrying the Doncaster/Sheffield line, is in regular use and has not been surveyed. The disused Cadeby railway tunnel which runs beneath the Cadeby quarry haul road functions as a hibernation site and is regularly surveyed.

Other tunnels and caves

Cuttings and fissures: The deep cuttings of the Dearne Valley railway, slicing across Cadeby Common and to the rear of Nearcliffe Quarry, opened up a series of limestone fissures and potholes which feature in Gibson et al. (1976) and Brook et al. (1988). The deep cutting through Pot Ridings Wood SSSI also revealed a fissure which features in Brook et al. (1988). These have developed a cave fauna and are used by bats as feeding and roosting sites.

Caves and fissures:



Cadeby Cave being inspected by DNS and SYBG members *Photo:SYBG*

Although well known to generations of local youngsters, the limestone caves, and fissures both natural and those revealed by a history of limestone quarrying have since the 1970s been surveyed and documented by the caving fraternity (Gibson et al. 1976, Brook et al. 1988). These sites have developed a cave fauna and are used by bats as summer feeding perches and winter hibernacula.

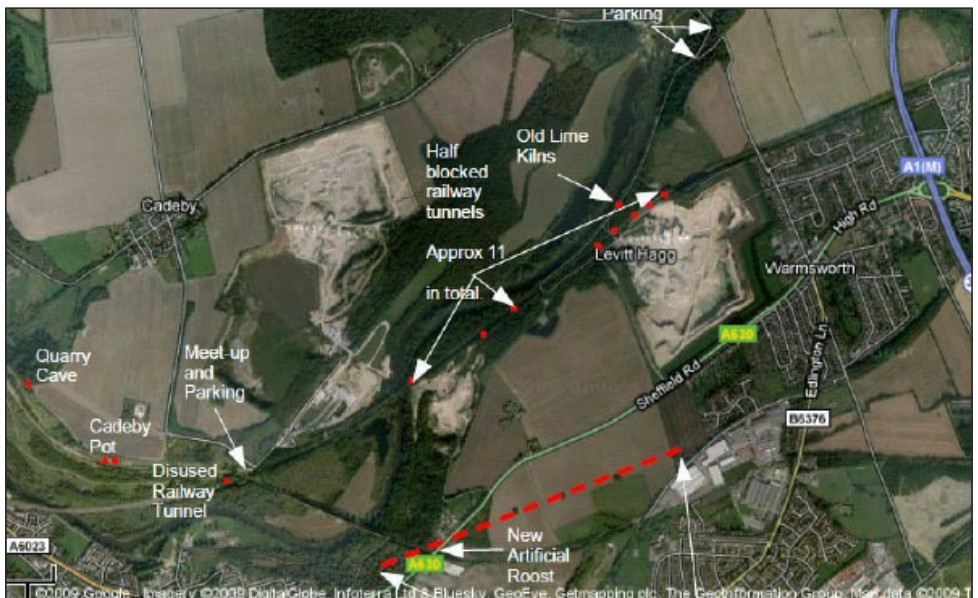
Pipe Tunnels: In order to conduct a network of cast iron water pipes from Thrybergh Reservoir to the Doncaster Water Works, in the 1870s a series of tunnels were built. In 1878 the section was cut through the fractured, fissured and cambering limestone of the Don Gorge from a trench in Nearcliffe Wood (SK/525991) to a reservoir in Warmsworth (SK/541999). Generations of youngsters from Edlington, Warmsworth and Conisbrough have crawled through the five sections and bases of the four ventilation shafts of the Nearcliffe 'Pipe Tunnel as a childhood 'dare'. Despite occasional disturbance by children and maintenance engineers, this tunnel has proved to be a hibernation site for at least four bat species.

Review of bat records - per bat site

Earlier reviews of the work of the Don Gorge Bat Group have been published in Howes (1993, 1996) and Lane (1997, 1999).

SOUTH SIDE OF DON GORGE

Note. The tunnel numbering is sequential from Levitt Hagg (1) upstream to 'Rainbow Bridge' (15). Numbers in square brackets [] refer to those used by Railtrack (British Rail) engineers for inspection purposes.



Map showing sites of bat hibernacula. Prepared by the South Yorkshire Bat Group

Tunnel 1 [68]

Height (Max) 2.5m, Height (to arch) 1.3m, Width 2.2m, Length 42m, Status- Blocked. Brick & stone construction. Now fenced within the Levitt Hagg Landfill site.

18.02.90 No bat signs.

06.02.94 4 bat droppings (? *Plecotus* sp.).

Gaps in roof and walls suggested that specimens could well be hibernating out of sight.

20.02.94 1 Brown long-eared bat in unpointed stone-work in the tunnel roof.

26.02.95 Not examined - fenced within the Levitt Hagg Landfill Site.

26.01.97 Not examined.

09.02.97 Not examined.

24.01.99 1 Brandt's bat (det.T.L.) on exposed brickwork, 2.5m up and 15m into tunnel (first record for the Doncaster district). 1 Daubenton's bat in brick crevice 25m into tunnel. On the tunnel floor beneath the roof crevice was an accumulation of bat droppings of varying types and antiquity, including those of *Plecotus* sp.

07.02.07 Pile of bat droppings on the floor below a crevice in the roof.

28.02.09 1 Natterer's bat and 1 ?Natterers/Daubenton bat.

15.01.11 2 *Myotis* sp, one of which was identified as a Natterer's Bat in roof crevices.

07.01.12 2 *Myotis* sp.

11.02.12 2 *Myotis* sp. (possibly Daubenton's Bats).

Tunnel 2 [67]

Height (Max) 1.9m, Height (to arch) 1.2m, Width 3.0m, Length 41m, Status - Blocked. On slight curve. Entrance obstructed by heap of limestone fines.

18.02.90 No bat signs.

06.02.94 No bat signs.

20.02.94 No bat signs.

26.02.95 6 bat droppings (possibly Brown Long-eared Bat) on freshly deposited flood silt c30m into the tunnel.

26.01.97 A few scattered bat droppings.

09.02.97 Bat droppings.

24.01.99 Occasional small bat droppings.

13.01.07 1 Natterer's Bat in a roof crevice.

28.02.09, 15.01.11, 07.01.12, 11.02.12 No bat signs.

Tunnel 3 [66]

Height (Max)2.5m, Height (to arch)2.2m, Width 2.1m, Length 21.2m, Status - Blocked. Brick arch for first 18.5m then widens to all stone end section 3.0m high and 2.5m wide.

18.02.90 No bat signs.

06.02.94 1 Daubenton's bat and evidence of a Brown long-eared bat summer feeding perch in the form of about 100 bat droppings and a collection of discarded moth wings.

- 26.02.95 Scattering of droppings and 7 discarded herald moth wings on recently deposited lime silt from recent flooding indicating recent bat (possibly Brown Long-eared) feeding activity.
- 26.01.97 Brown long-eared bat droppings and discarded moth wings.
- 09.02.97 No bat signs.
- 08.02.98 Concentration of Daubenton's bat droppings 3m from entrance.
- 24.01.99 Accumulation of bat droppings and discarded moth wings under inner arch 20m into tunnel. Clear evidence of feeding perch of Brown long-eared bats.
- 13.01.07 No bat signs.
- 28.02.09 Bat droppings – suggesting seasonal feeding roost.
- 15.01.11, 07.01.12, 11.02.12 No bat signs.



One of the tunnels below the Doncaster to Sheffield railway line at Levitt Hagg.

Photo SYBG

Tunnel 4 [65]

Height 2.4m, Max Height to arch 2.1m, Width 2.2m, Length 40.7m, Status - Blocked. Corrugated iron partition at 19.5m. Brick end-section 2.6m high and 2.5 wide.

- 18.02.90 1 Brown long-eared bat crevice between brickwork.
- 01.3.93 1 Brown long-eared bat on right hand wall to rear of corrugated partition.
- 06.02.94 1 Daubenton's bat and evidence of Brown long-eared bat roost in the form of a concentration of droppings.
- 26.02.95 Old bat droppings.
- 26.01.97 1 Brown long-eared bat 5m in from entrance. Last summers aggregation of Plecotus droppings together with pile of discarded moth wings indicating well used feeding roost.
- 09.02.97 Plecotus sp. (signs droppings) but bat had gone.
- 08.02.98 Discarded moth wings were evidence of summer Brown long-eared bat feeding site.

24.01.99 Evidence of recent occupancy/disturbance. Corroged iron partition demolished. No signs of bats.

13.01.07, 28.02.09 No bat signs.

15.01.11 Brown Long-eared Bat in roof crevice at the far end.

11.02.12 Bat droppings found.

Tunnel 5 [64]

Height Max, Height to arch, Width, Length - Not measured. Status – Open. Road into active quarry.

18.02.90 Main road access to 'Pilkington's Quarry'. Too wind-swept and light to be suitable as a bat roost site. No bat signs.

06.02.94 No bat signs.

26.02.95, 26.01.97, 09.02.97, 08.02.98 No bat signs.

24.01.99 River-side end of tunnel now has metal gate. 1 Daubenton's bat in roof crevice between stonework and brickwork junction (first evidence of bat in this open tunnel).

13.01.07 No bat signs.

28.02.09, 15.01.11, 07.01.12, 11.02.12 No bat signs.

Tunnel 6 [63] (No longer extant)

Height Max, Height to arch, Width, Length - Not measured. Status – Open. Pedestrian access to Pilkington's Quarry. Light and wind-swept.

18.02.90 No bat signs.

06.02.94, 26.02.95, 26.01.97, 09.02.97, 08.02.98 No bat signs.

24.01.99 Tunnel lost - back-filled with aggregate during 1998.

Tunnel 7 [62]

Height Max 2.3m, Height to arch 1.1m, Width 2.1m, Length 23m. Status - Blocked Brick arch for first 17m then widens slightly.

18.02.90 1 Natterer's bat in joint where tunnel alters construction and widens out.

06.3.90 1 Natterer's bat as above, 1 Daubenton's bat in crevice between stone work.

18.3.90 1 Natterer's bat.

Winter 1992 Evidence of summer roost (many droppings) but no recent bat signs.

06.02.94 Two large batches of droppings (several hundreded each) (found by MM) indicating the presence of a thriving *Myotis* (possibly Daubenton's bat) summer colony.

20.02.94 1 Daubenton's bat in joint in roof.

26.02.95 Many old bat droppings and some discarded herald moth wings showing signs of recent occupancy.

26.01.97 *Plecotis* droppings plentiful.

09.02.97 *Plecotis* droppings plentiful.

08.02.98 1 Daubenton's bat in stonework crevice with many droppings beneath.

24.01.99 Partly back-filled with aggregate during 1998. Only about half of tunnel still surviving. Several bat droppings.

28.02.09, 15.01.11, 07.01.12, 11.02.12 No bat signs.

Tunnel 8 [61]

Height Max 3.8m, Height to arch 2.4m, Width 2.6m, Length 19.5m, Status - Blocked.

Very lofty brick and stone construction with floor sloping steeply up to rear.

18.02.90 No bat signs.

06.02.94 5-10 bat droppings indet.

20.02.94, 26.02.95, 26.01.97, 09.02.97, 08.02.98, 24.01.99, 28.02.09, 15.01.11, 07.01.12, 11.02.12 No bat signs.

Tunnel 9 [60]

Height Max, Height to arch, Width not measured. Length 20m+, Status - Blocked

18.02.90, 06.02.94, 20.02.94, 26.02.95 No bat signs.

26.01.97 Daubenton's bat in a rear crevice. A number of bat droppings.

09.02.97 Daubenton's bat in a rear crevice.

08.02.98 1 Brown Long-eared bat in stonework slot.

24.01.99 1 bat dropping only.

28.02.09, 15.01.11, 07.01.12, 11.02.12 No bat signs.

Tunnel 10 [59]

Height Max, Height to arch, Width, Length not measured. Status - Open

Notes: Main Haul Road for Landfill lorries and Dust Carts.

18.02.90 Main road access under modern concrete bridge.

06.02.94 No bat signs

20.02.94, 26.02.95, 26.01.97, 08.02.98, 24.01.99, 28.02.09, 15.01.11, 07.01.12, 11.02.12
No bat signs.

Tunnel 11 [58]

Height Max, Height to arch, Width not measured. Length 10m+, Status - Open

18.02.90 Drafty and fairly light. No bat signs.

06.02.94 Used by trail bikes.

20.02.94, 26.02.95, 26.01.97, 08.02.98, 28.02.09, 15.01.11, 07.01.12, 11.02.12 No bat signs.

Tunnel 12 [57]

Height Max, Height to arch, Width not measured. Length 20m+, Status - Open
Tunnel at river level.

18.02.90 1 Brown Long-eared bat in very damp conditions in stonework crevice
low down near puddles and river flood debris.

06.02.94 Tunnel waterlogged and showing a debris strand line about 4'6"
up the wall from recent flooding. Strong smell of diesel. No bat signs.

20.02.94 Waterlogged from recent flooding. No bat signs.

26.02.95 Tunnel recently flooded to about 5' and river end still waterlogged to 1'.
1 Brown Long-eared bat found in similar location to that on 18.02.1990.

26.01.97, 28.02.09, 15.01.11, 07.01.12, 11.02.12 No bat signs.

Tunnel 13 [56]

Height Max, Height to arch, Width not measured. Length 10m+, Status - Open Tunnel at river level

18.02.90 Drafty and fairly light. No bat signs.

06.02.94 Used by trail bikes.

20.02.94, 26.02.95, 08.02.98, 28.02.09, 15.01.11, 07.01.12, 11.02.12 No bat signs.



Natterer's bat in a cave crevice

Tunnel 14 [55]

Height Max, Height to arch, Width not measured. Length 20m+, Status - Blocked

18.3.90 Very damp and silty from recent flooding. No bat signs.

06.02.94 Very damp and silty from recent flooding. About 10 bat droppings.

20.02.94 As above with many brown rat footprints in the wet silty mud.

26.02.95 Very wet and silty from recent flooding. No bat droppings or bats.

26.01.97, 08.02.98, 28.02.09, 15.01.11, 07.01.12, 11.02.12 No bat signs.

Tunnel 15 [54]

Height Max, Height to arch, Width not measured. Length 20m+, Status - Open

18.02.90 No bat signs.

06.02.94 Access not possible due to wire and debris and a deep layer of lime silt/slurry washed down from the quarry above during recent heavy rains.

20.02.94 As above with many brown rat footprints in wet silty mud.

26.02.95 As above though much of wire now removed.

26.02.97, 08.02.98, 28.02.09, 15.01.11, 07.01.12, 11.02.12 No bat signs.

Pair of Limestone Hearths [nr tunnel 63]

To the east (downstream) of main limekiln are the exposed (cut away) hearths of what had been a row of four limekiln hearths. Two remain. These are set back from the road, nestle into the hillside and are partly hidden by heaps of rarth/rubble and invading shrubs.

08.02.98 No bat signs.

Levitt Hagg Lime Kilns [nr tunnel 62]

09.02.97 The large intact double chambered kiln, built into the hillside adjacent to the riverside haul road was examined by DA; CAH; HK & PS. The two hearths, left and right frontages and kiln chambers are constructed of limestone blocks. The side and front buttresses are constructed of 'Conisbrough Rustic' bricks. Some 32 square sectioned breath holes were open to the frontage. Due to their curved or angled penetration of the kiln structure it was not possible to gauge their depths but probing with a flexible stick showed them to be at least 1.5m deep, the damper ones having a potential as roost sites. No bat signs were located but an empty puparium of a bat fly (Nycteribidae) was found in one of the holes on the right frontage.

Pair of Limestone Hearths (beneath kiln)

08.02.98, 24.01.99, 15.01.11, 07.01.12 No bat signs.

11.02.12 1 *Myotis* sp. in western-most low kiln.

13.02.00 No bat signs.

15.01.11 6 bat droppings (unidentified).

Cave 4 below cave 2 a low crawl gives access to a 2m long chamber.

29.03.98 No bat signs.

07.01.12, 11.02.12 - all caves visited, no bats found.

Limestone hearth [between Haul road bridge 59 and tunnel 58]

08.02.98 No bat signs.

Farcliffe Wood Quarry Caves (SE532002)

Cave 1 'Lion's Mouth' Through railway culvert 56 and into the quarry to rear where an obvious wide mouthed cave entrance can be reached up a short scramble.

29.03.98 1 Whiskered bat found in rocky overhang of cave mouth.

13.02.00 1 bat dropping to the right hand side in the right hand fissure of the entrance rock.

Cave 2 About 25m west of the 'Lion's Mouth' 1 and at the same elevation is a tight rift.

29.03.98 No bat signs.

13.02.00 No bat signs

Cave 3 Further west of cave 2 and lower down the quarry three interconnected entrances give access to a 6m long chamber.

29.03.98 Moth wings and bat droppings suggest useage by *Plecotus* sp.

Nearcliff Wood Tunnel (Yorkshire Water 'Pipe Tunnel')

Section 1

- 18.02.90 1 Brown long-eared bat, 1 Whiskered bat and 2 Natterer's bats in the section from Nearcliff wood to the first air shaft.
- 24.02.93 1 Whiskered bat, 1 Brown long-eared bat and 1 Natterer's bat near the metal roof section.
- 06.02.94 Only examined the section from the entrance to the first air-shaft. In the segment which runs beneath the disused railway cutting 2 Whiskered bats, 1 Daubenton's bat and a *Myotis* specimen with very pale underparts and a reddish forearm, which may have been a Natterer's bat, were located.
- 20.02.94 1 Whiskered bat in fractured brickwork on right side near engineers mark (22/12E). 1 *Myotis* sp. in rock fissure in centre of roof about 4/5th of the way to the 1st air shaft.
- 26.02.95 The two survey groups collectively located 2 Daubenton's bats, 1 Natterer's bat and 1 Whiskered bat in the first section.
- 26.01.97 1 Brown long-eared bat, 1 Daubenton's bat and 2 Whiskered bats.
- 08.02.98 1 Brown long-eared bat at end of first brickwork section. 2 Whiskered bats in limestone fissures. 1 Natterer's bat in centre of roof.
- 13.12.98 ? Daubenton's bat in stone crevice 30m from entrance.
- 24.01.99 No bats found.
- Jan 2003 1 Brown long-eared bat. 1 unidentified *Myotis* sp. seen flying after we passed by.
- 28.02.09 1 Natterer's bat located in crevices at head height approximately 20 metres from 1st airshaft.

Section 2

- 26.02.95 No bats found.
- 13.12.98 No bats found.
- 24.01.99 No bats found.
- Jan 2003 1 Natterer's bat.

Section 3

- 26.02.95 Tony Lane and Derek Eames's group located a single Whiskered bat in the section between air shafts 2 and 3. Sadly their further progress was prevented by children dislodging brickwork and hurling it down the 3rd air shaft!
- 08.02.98 No bats found, but 1 Daubenton's bat in limestone crevice in air shaft.
- 13.12.98 1 Daubenton's bat in stone roof crevice 35m from shaft 3.
- 24.01.99 1 Daubenton's bat in same roof crevice as in 1998.
- Jan 2003 1 Daubenton's bat.

Section 4

- 08.02.98 1 Natterer's bat in limestone crevice 30m from air shaft 4. 1 Daubenton's bat exposed on limestone 40m from air shaft 4.
- 13.12.98 Whiskered bat on exposed stone 8m from shaft 4. Brown long-eared bat on exposed brickwork 5m from shaft 4.
- 24.01.99 1 Whiskered bat on exposed brickwork, 8m from shaft 4.
- Jan 2003 No bats found.

Section 5

08.02.98 1 Daubenton's bat in limestone crevice 30m from Warmsworth entrance.
13.12.98 (Warmsworth end) No bats found.
24.01.99 1 Brown long-eared bat on exposed brickwork 40m from portal.
Jan 2003 No bats found.

Full length of 'Pipe Tunnel' examined 24.01.10. 1 Natterer's bat and 1 unidentified *Myotis* bat.

Overhang Cave SK528993 (Brook et al. 1988) (also known as Nearcliff Rock Shelter).

20.02.94 1 Brown Long-eared bat.
26.02.95 Much human disturbance. No bat signs.
26.01.97 No bat signs. 11.10.98 Good bat crevices but no bat signs noted.
15.01.11 Bat droppings found, following a find here of a Natterer's Bat by M.Nowacki (SYBG) - date unknown.

Nearcliff Railway Ravine Caves (Dearne Valley)

26.02.95 A number of caves, and fissures on both faces of this very deep railway cutting were examined by members of the Derby BG. The large cave on the east (Warmsworth) side [High Rift & Eanch Rift Caves] contained 1 Brown Long-eared bat and a small crevice on the west (Conisbrough) side [Short Rift Cave] contained 1 Natterer's bat.
26.01.97 (Conisbrough side ? Short Rift Cave) Two caves entered. No bat signs. (Warmsworth side High Rift & Eanch Rift Caves) Two caves examined, one had quantities of discarded moth wings indicating the presence of Long-eared Bat summer feeding perch.

Short Rift Cave SK528993 (Brook et al. 1988). Two adjacent but unconnected caves.

Cave A) 15m long about 30m west of High Rift Cave.

11.10.98 1 bat dropping found.

Cave B 5m long, 2m left of cave A.

11.10.98 No bat signs found.

High Rift Cave SK528993 (Brook et al. 1988).

26.02.95 1 Brown long-eared bat.

26.01.97 Quantities of discarded moth wings suggest useage by *Plecotus* sp.

11.10.98 Two sizes of bat droppings, the larger resembling those of *Plecotus* sp.

Eanch Rift Cave SK528993 (Brook et al. 1988).

11.10.98 No bat signs.

Nearcliffe Wood Rift SK527995 (Brook et al. 1988) Also known locally as Banana Cave & Dragon Cave.

18.02.90 No bat signs.

26.02.95 Members of the Derby BG made good progress with its investigation but found

- no bat signs and judged the conditions probably too dry as a hibernation site.
- 26.01.97 No bat signs.
- 11.10.98 Kingston CC found much evidence of disturbance but at furthest extremities found two sizes of bat droppings, the larger resembling those of *Plecotus* sp.

NORTH SIDE OF DON GORGE

St Dominick's Crag Cave

(25m north-east of old engine house. Wide entrance had been modified to make a 'folly' with a temple-like appearance and lofty ceiling. Dimensions: Height 4m; Width 10m; Depth 5m)

- 13.12.1998 As the survey party arrived, about 30 minutes after dusk, a bat flew out of the cave. Fresh small bat droppings were found directly under a suitable roof crevice and *Plecotus* sp. droppings were found scattered.

Railway Pot SE527005 (Brook et al. 1988).

1.2km east of Cadeby and on the east side of railway cutting through Pot Ridings wood is a 35ft long rift with a depth of 10ft (Brook et al. 1988).

- 13.12.1998 No bat signs.

Cadeby Railway Tunnel (disused) (SK521996)

Height Max, Height to arch, Width - not measured. Length 148.7m. Status Open.

- 18.02.90 1 Brown long-eared bat. 1 Pipistrelle flying at dusk by woodland near tunnel.
- 5.12.93 2 Daubenton's bats.
- 1.01.94 3 Daubenton's bats and 1 Brown long-eared bat.
- 30.01.94 1 Brown long-eared bat.
- 25.01.98 1 Daubenton's bat 2m up in crevice between stonework and 15m in from east portal. 1 Brown long-eared bat 1m up in stonework crevice 20m in from east portal.
- 13.12.98 1 Brown long-eared bat in brick crevice ?200m from west portal. 1 Brown long-eared bat in brick crevice ?215m from west portal.
- 07.02.04 1 Brown Long-eared bat in a crevice $\frac{2}{3}$ of the way (west to east) along the tunnel. 1 Brown Long-eared bat in a crevice on left side $\frac{2}{3}$ of the way in. 1 Natterer Bat in crevice not far from the quarry end of the tunnel.
- 13.02.05 1 ? Pipistrelle dropping about 10m into tunnel eastern portal. 1 Brown Long-eared bat low down, 102m in from western portal. 1 Brown long-eared bat both in crevices on south wall 106m in from western portal. 1 Natterer's Bat in crevice on north wall, 132.5m in from western portal. 1 unidentified bat in crevice on north wall, ?132m in from western portal. 10 to 15 droppings on the floor of the 3rd, eastern most refuge on the north side.
- 26.02.06 1 Long-eared bat in crevice on north wall.
- 13.01.07 1 Natterer's bat approx 2 metres from the second refuge. 1 Brown long-eared bat on north wall approx 20 metres from the eastern tunnel portal.
- 11.02.12 No bats found.

Cadeby Pot SK516996 550m west of viaduct to north of old Dearne Valley railway cutting and 200m beyond Constitution Hill foot bridge (Brook et al. 1988).

25.01.98 Bat droppings plentiful and widespread, probably of *Plecotus* sp. and *Myotis* spp.

29.03.98 Bat droppings widespread, of mixed ages and sizes, probably of *Plecotus* sp. and *Myotis* spp.

Cadeby Cave SK513996, also recorded as 511998 and 515996.

800m to west of viaduct in small derelict quarry on north side of old Dearne Valley railway cutting, overlooking the Earth Centre (Brook et al. 1988).

25.01.98 (Eastern fissure) Discarded hind wing of Peacock butterfly had 'V' shaped bite removed, indicating attack by a Brown long-eared bat.

(Western chamber) entered by very narrow 'feet first' slither at ground level was in fact extremely capacious. 1 Brown long-eared bat and 1 Natterer's bat. The presence of small concentrations of bat droppings indicated the site was used during the summer months.

29.03.98 Discarded moth wings and bat droppings.

13.12.98 1 Brown long-eared bat and droppings of mixed ages in main chamber.

07.02.04 1 Brown long-eared bat.

13.01.07 1 Brown Long-eared bat and 2 Natterer's bat were seen.

11.02.12 1 *Myotis* sp.

Cadeby Rift on western side of same disused quarry overlooking the Earth Centre.

29.03.98, 13.12.98 No bat signs.

Barnburgh Craggs Rifts SE500037 (East to west)

A group of small caves about 1.5km ENE of Barnburgh, in a long quarried scar west of the Marr/Harlington on north side of public footpath (Brook et al. 1988). Surveyed by: TL; CA; DA; FD; HD; PS & TS.

13.02.2000 Cave 1 10m long (20m w of Marr/Harlington Rd) No bat signs.

13.02.2000 2nd crevice. No bat signs.

13.02.2000 3rd crevice. No bat signs.

13.02.2000 2nd Cave 'Fox Cave' (40m w of Marr/Harlington Rd. and 13.5m long (Brook et al. 1988)). Strong smell of fox inside and a fox skull near the entrance. No bat signs.

13.02.2000 3rd Cave 'Sargeant's Cave' (w of 2nd cave and 9m long Brook et al. 1988) (3 horizontal rocks near entrance). Wide fissure jammed with rocks. Possible to squeeze in about 5 metres before becoming too tight but it does go on. No bat signs.

13.02.2000 Next fissure to west 'Slim Jim Rift' on 2 levels one above the other. No bat signs.

13.02.2000 Next fissure to west 'Rabbit Fissure' (rabbit activity in and around) 16 feet wide and 6 inches high - runs at rt. angle to cliff face. No bat signs.

Review

At least five species of bat have been shown to use subterranean sites in the Don Gorge for winter hibernation, summer breeding, roosting and as feeding perches. An analysis of our records show that positively identified bats have been recorded from some fourteen sites. Table 1 shows the numbers of bat species per site and Table 2 shows the number of locations in which each species has been encountered.

Table 1. Number of bat species per site (to 2010)

No. of bat species	No. of sites
1	5
2	6
3	1
4	2

Table 2. Number of sites per bat species (to 2010)

	No. of locations
Brandt's bat	1
Whiskered bat	1
Natterer's bat	7
Daubenton's bat	8
Brown long-eared bat	11

These figures are based on torchlight surveys rather than endoscopic searches, emergence counts, trapping or netting and therefore represent a mere sample of what is really going on.

Acknowledgements

A huge debt of gratitude is due to over eighty volunteers and bat-site licence holders from twenty one organisations who have turned up in sun and sleet, wind and frost and made these surveys possible. Surveyors are listed as follows (most frequent attenders are highlighted in bold):

Derek Allen (DNS), Trevor Atkinson (DBG), S. Bellinger, Eric Bennett (BBG), Nick Bonsall (SYBtG), Nora Boyle (DNS), Peter Bullock (DNS), Darren Buxton (DNS), Thomas Buxton (DNS), Steve Callaghan (DM), Frank Carpenter (DM), Barry Collins, Barry Cox (BTC), Rick Belt (SYBtG), Steve Cunliffe (BTC), Bill Curtis (EYBG), Marjory Curtis (EYBG), Clive Dennison (SHCS, KCC), Frank Devine (DNS/LHAG), Helen Devine (DNS/LHAG), Andrea Donaldson (HU [Jamaica]), Derek Eames (NNBG), Janet Eames (NNBG), Heather Ferris (EYBG, KCC), Fez Ferris (EYBG, KCC), Paul Flynn (BTC), Tony French, DNS, John Gardner (WBG/WNS), Heather Gardner (WBG/WNS), Dave Green (BTC), Martin Greenland (DNS), Paul Gregory (NNBG), Vanessa Gregory (NNBG), Jim Griffith (RNS), Joanne Hanmer (WYBG), Andrew Hamilton (EYBG), Andrew Hill (DNS), Louise Hill (DNS), Joe Hopkinson (SYBaG), Rachel Hoskins (DMBC Planning), Colin Howes (DM/DNS), Michael Jackson (DM), Gill Johnson (DNS), Helen Kirk (DNS), Tim Kohler (EN), Julian Lane (EYBG), Tony Lane (EYBG), A. McBride (BTC), A. McCreadie, Robert Mantiaj (NNBG), Jamie Middleton (RB), Martin Moss (CC), Colin Neil (HCS), Paul Northcliffe (NNBG), Sarah

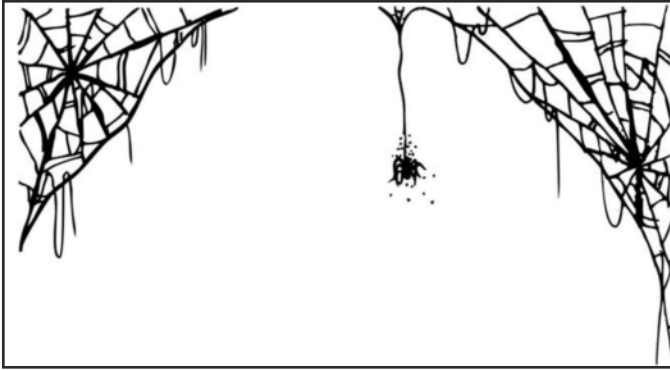
Procter (EYBG), Tim Prosser (DNS), Derek Robinson (NNBG), Pauline Robinson (NNBG), Peter Sandbach (DBG), Brenda Scott (NNBG), Rita Scott, Pip Seccombe (DNS), Tim Seccombe (DNS), Joyce Simmons (DNS), Paul Simmons (DNS), Alaric Smith (HU [Kent]), Ian Thompson (BTC), Jason Thornton (WYBG), Jeff. Thornton (DNS), Alison Thurston (EYBG), Colin Wall (DNS), Jo Walker (NNBG), Anne Ward (NNBG), Margaret Waterhouse (TCG), Cathy Wood (EYBG), Roger Wood (DBG), Paul Woofenden (DBG), Derek Whitcher (SYBaG), Matt, Andy and Sonya (LBG).

Abbreviations for Organisations

BBG	-	Barnsley Bat Group.
BTC	-	Bentley Training Centre (DMBC).
CC	-	Countryside Commission (Leeds).
DBG	-	Derby Bat Group.
DM	-	Doncaster Museum.
DNS	-	Doncaster Naturalists' Society.
EN	-	English Nature (Wakefield).
EYBG	-	East Yorkshire Bat Group.
HCS	-	Hatfield Comprehensive School (Lab.).
HU	-	Hull University.
KCC	-	Kingston-upon-Hull Caving Club.
LBG	-	Lancashire Bat Group
LHAG	-	Levitt Hagg Action Group.
NNBG	-	North Nottinghamshire Bat Group.
RB	-	Rotherham Batworker.
RNS	-	Rotherham Naturalists' Society.
SYBaG	-	South Yorkshire Badger Group.
SYBtG	-	South Yorkshire Bat Group.
WBG	-	Wakefield Bat Group.
WNS	-	Wakefield Naturalists Society.
WYBG	-	West Yorkshire Bat Group.

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Cave spiders of the Don Gorge

Colin A. Howes

Since 1990 members of the Don Gorge Bat Study Group have made regular winter visits to the numerous limestone fissures and caves and derelict tunnels and lime kilns within the Don Gorge. Spiders are an obvious feature of the subterranean fauna and have featured prominently in our monitoring of the fascinating underground environment. Examples of the invertebrate fauna, including spiders, have been collected or noted and where possible the air temperature and humidity has been recorded where they occur.

Species zonation

A preliminary comparison between the locations of spider species in cave and tunnel structures and the influence of relative humidity regimes show a marked species zonation.

The large hairy-legged House Spider *Tegenaria gigantea*, the Hobo Spider *T. agrestis* and the Woodlouse Spider *Dysdera crocata* were encountered under the dry limestone rubble and stonework at tunnel and cave entrances and in dry situations under masonry associated with disused limekilns.

The funnel-web spider *Amaurobius similis* appears to take over in crevices and under loose masonry perhaps within the first metre of the entrance, perhaps requiring a slightly higher level of humidity than the previously mentioned species. Curiously, although this spider is active nocturnally, the zones of occupied webs seemed to be concentrated in areas of tunnel walls enjoying reasonably strong light levels.

The Portal Spider *Metellina merianae*, perhaps the first true cave 'threshold' spider amongst these, tends to be encountered in the zone within the first 30 metres of the tunnel or cave entrance. Although they have been encountered in humidity regimes ranging from 64% to 93% Rh, they seem to prefer only slightly humid rather than wet situations, the mean Rh. of five sites being 73.4%.

The Cave Spider *Meta menardi* tends to take over beyond the first 20 metres of the entrance, evidently preferring the zones of total darkness and higher humidity. Levels



Cave spider *Meta menardi*
(female) and her egg
cocoon



of humidity occupied by this large and rather spectacular spider have ranged from 73% to 97%, the mean of sixty sites being 88% Rh.

Adults, sub-adults and their large suspended cotton-wool ball egg cocoons are present at all times of the year and freshly hatched spiderlings have been seen dispersing in January and February. Adult males appear to be rarely encountered; of 48 adults counted in February 1998 only eight (16.6%) were males.

Since *M. menardi* webs are constructed most frequently within in the preferred hibernation zone of large numbers of mosquitoes and herald moths, it is assumed that these form a significant proportion of prey indeed the remains of both have been found in webs, so too have the snake millipede *Cylindroiulus* sp. and the flat-backed millipede *Polydesmus* sp.

The above observations are highly preliminary but demonstrate how tunnel and cave systems can be used as field laboratories for monitoring the environmental preferences and limitations of a range of organisms. Clearly, for arachnologists with access to light and humidity metres, a number of fascinating ecological projects present themselves.

Acknowledgements

Thanks are due to Tony Lane for most of the environmental readings and members of the Don Gorge Bat Study Group for their unflagging assistance over the years.

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Notes on the Lepidoptera of subterranean sites in the Don Gorge, Doncaster

Colin A. Howes, Tony Lane and Louise Hill

Since 1990 members of the Don Gorge Bat Study Group have made regular visits to the numerous subterranean sites in the Don Gorge in search of winter hibernation and summer nursery and roosting sites for bats. Examples of the invertebrate fauna, including hibernating Lepidoptera (Moths and Butterflies), have been noted and there has been significant monitoring of temperature and relative humidity regimes.

Species Zonation

A preliminary comparison between the locations of species in cave and tunnel structures and the relative humidity levels where they occur show a marked species zonation (see Figure 1).

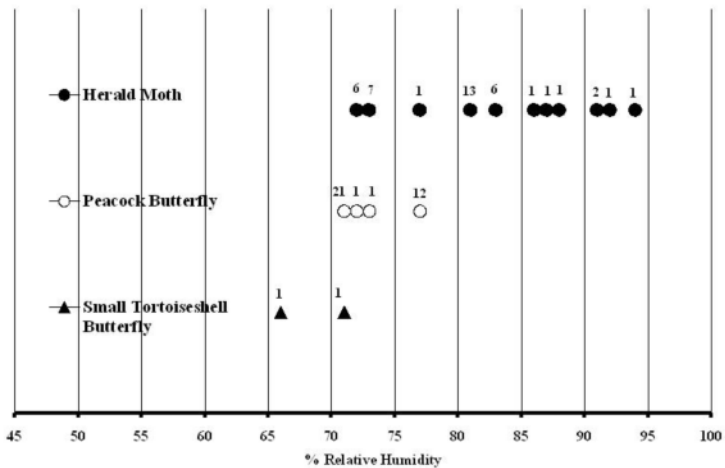


Figure 1: Comparisons of the preferred humidity zones of hibernation sites for Herald Moth, Peacock butterfly and Small Tortoiseshell Butterfly according to ranges of relative humidity in subterranean sites in the Don Gorge (January and February 1998).

Numbers refer to the number of individuals encountered at each humidity zone.

Hibernating Herald moths *Scoliopteryx libatrix* occur singly or in groups in the darker and damper zones of most sites, with a relative humidity range from 72% to 94% with a mean of 76.33% Rh with specimens often covered by droplets of condensation. Its high frequency in local subterranean sites may be explained by the abundance in the Don Gorge of its food-plants, various willow and poplar species. In late summer and autumn, newly emerged adults move directly to sheltered sites such as caves by orienting towards any dark area in their visual field. The purpose of this migration and subsequent hibernation, at least for females, is for them to undergo an ovarian diapause which seems

necessary for the production of viable eggs (Tucker 1964, Jefferson 1983). Specimens are occasionally taken as prey by the 'Cave spider' *Meta menardi*.

Although considerable overlap of hibernation sites exist in terms of distance from entrances and humidity regimes, Peacock butterflies *Inachis io* tend to be in slightly dryer zones than are preferred by Cave spiders and Herald moths with a relative humidity range from 71% to 77% with a mean of 73.14% Rh.

The Small Tortoiseshell *Aglais urticae* which frequently hibernates in relatively dry sheds, garages and attics was only encountered underground in sites with relative humidity levels of 66% and 71%, giving a mean level of 68.5% Rh.



Left: Herald moth showing the condensation frequently seen on hibernating moths and butterflies, and Right: Tissue moth Photos J.Simmons

In winter 1992 a single specimen of the Tissue moth *Triphosa dubitata*, apparently a scarce species in lowland Yorkshire (Sutton & Beaumont 1998) and the first Doncaster record, was photographed in one of the tramway tunnels by John Gardner of the Wakefield Naturalists' Society. Two other geometrid moths seen in the tunnels, but which evaded capture, were also thought to have been this species. On 15 January 2011 a Don Gorge Bat Group visit encountered a second confirmed Tissue moth, again on the wet and (in torchlight) glistening walls of one of the blocked tramway tunnels. This was photographed by Louise Hill (see Figure 2). Unlike the quiescent Herald moths, Tissue moths remain relatively active underground in autumn and winter and indeed have been observed mating in Yorkshire caves in October (Dixon 1974). Its food-plants, Buckthorn *Rhamnus cathartica* and Blackthorn *Prunus spinosus*, are present in the Don Gorge near to the tramway tunnels so a viable population may exist. According to the website of the Yorkshire Dales National Park, the Tissue moth is a characteristic feature of caves and potholes of the Pennine Dales.

Of 130 hibernating lepidoptera counted in Don Gorge tunnels and fissures and caves in February 1998, the Herald moth was the most frequent with 73 (56.2%) specimens compared with 54 (41.5%) Peacock butterflies. Curiously the Small Tortoiseshell was only encountered underground on two occasions.

The above observations are highly preliminary but demonstrate how tunnel and cave systems can be used as field laboratories for monitoring the environmental preferences and limitations of a range of organisms. Clearly, for local naturalists with access to light and humidity meters, a number of fascinating ecological projects present themselves.

Thanks are due to members of the Don Gorge Bat Study Group for their unflagging assistance over the years.

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Victorian botanical eco-tourists in the Don Gorge

Colin A. Howes

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The Don Gorge was famously placed on the botanical map by a procession of notable South Yorkshire botanists of the 19th century. These included Jonathan Salt (1759-1815) of Sheffield, Samuel Appleby of Balby (bapt. 1806-1868), William Robson Scott (1811-1877) of Doncaster, George P. Nicholson (bapt. 1814-1883) of Wath, Peter Inchbald (bapt. 1816-1896) of Adwick, Oswald Allen Moore (1818-1862) of Doncaster and York, John Henry Payne (1857-1931) of Wath, Arthur Augustine Dallman (1883-1963) of Doncaster and Liverpool, and a succession of members of the Doncaster Naturalists' Society from the mid 19th century onwards. News of the rare and exciting plants of the limestone Gorge was published in the botanical literature of the time, notably *The Flora of Yorkshire* (Baines 1840) and the *Flora of West Yorkshire* (Lees 1888). It was also reflected in the sought-after herbarium sheets circulated within the scientific community. The botanical celebrity of the area was therefore trumpeted widely and attracted large numbers of botanists from throughout the north of England.

The *South Yorkshire Times* of 5 July 1889 reported on the annual visit to Conisbrough and the Don Gorge of an organisation known as the 'Lancashire Linnean Botanists'. About 1,200 excursionists were brought by special trains from Manchester, Oldham and

other Lancashire towns and were joined by a large contingent from Sheffield. The report reads “To the botanists Conisbro’ offers special attractions, the valley of the Don being exceedingly rich in rare and beautiful specimens of English flora. Among the party on Sunday were some well known and eminent naturalists, geologists and entomologists and all seemed well satisfied with the valuable specimens found in the woods and amongst the cliffs and crags ...”

On the last Sunday in June 1892 botanists again journeyed to the Don Gorge, the event reported in the *Doncaster Gazette* of 1 July 1892 as follows “On Sunday some hundreds of people travelled to Conisbrough by the Ashton District Botanists’ Excursion, and the day was spent in exploring the neighbourhood for herbal specimens. Fine weather prevailed. Late in the afternoon there was a meeting near the Station Hotel, and addresses were delivered bearing upon the days finds. Mr. J. Hannah stated that among the principal rarities gathered were the birch in fruit, the *Chara* or Stonewort, the Bird’s nest turquoise *Neottia nidus-avis*, the Toothwort *Lathraea squamaria* and also a parasitic plant [presumably referring to the Toothwort]. The Bird’s nest turquoise was discovered by Mr. Sheppard, a Sheffield botanist. A suggestion was thrown out that a list of plants in the neighbourhood should be made, as there are several rarities which are calculated to be destroyed by the [Cadeby] colliery extension being made”.

What a shame this list, if it was ever compiled, never survived as a record of what formerly grew on the site of the Colliery, itself now only a memory.



The ‘Rainbow’ Bridge
from Cadeby Quarry
Photo: *L.Hill*

Thanks are due to Martin Limbert and Andrea Marshall for locating the references in the *Doncaster Gazette* and *South Yorkshire Times*.

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A walk from Hexthorpe to Conisbrough

The following is based on the Society's minutes of a meeting in February 2010 when Hugh Parkin described a nostalgic walk he made. It has been written up by Derek Allen.

Hugh began with a photograph of a trolleybus on West Street taken in the 1960s with him standing beside it. The bus terminus on Urban Road at Hexthorpe was situated on the top of a former brassworks.

Hexthorpe Flatts (first referred to in 1568) is on the site of a former quarry which produced thin bedded limestone slabs or 'flatts' which were used for both floors and roofs - they cost 6d. per ton. Robert Paxman was asked by the Council in 1850 to survey the quarry with a view to restoring it as a park. This was finally realised in 1902 and it opened on Bank Holiday with a band and other entertainments. Hexthorpe Manor (later demolished) was still in existence at that time. The park was re-landscaped in 1929 and an aviary was constructed and during WW2 there was a rifle range. Band concerts were very popular (the entrance fee being 1d) and they continued throughout WW 2 and still occasionally take place. The park was illuminated in 1933 and in 1939 the play 'Merrie England' was performed. The pond, now dry as a health and safety issue, was much larger in the past and had wild ducks on it. Legend had it that Dick Turpin's cave was in the ravine. Mr. Parkin often used to help the gardeners take geranium cuttings and with the bowling and putting greens. He also helped the electricians with setting up the lights.

The Bell Pond between Hexthorpe and Sprotborough is an oxbow of the River Don and was named after Isabelle Dumas who came over from France in the 1680s. Another nearby pond is the result of mining subsidence.

In 1904 a boat was leased by the Council to a Mrs Anderson for £2 10s. to provide trips along the river. The boats were subsequently transferred to Sprotborough Flash. A rowing club was established on the river and became very successful. A new boathouse was opened in 2006 by Richard Caborn MP and is well used by a number of local schools.

In November 1910 a railway line was opened to divert some of the traffic which used to pass through Doncaster Station. The Horseshoe Tunnel passes underneath it. The nearby metal bridge over the river is a modern replacement for the former wooden one. The limestone quarry at Warmsworth provided stone for the new St. George's Church.

Sprotborough Hall, which overlooked the gorge, was demolished some years ago.

It had a pump which was used to raise water from the river up to the hall. There were two fulling mills in Sprotborough village which date back to the 13th century. They continued in use until c. 1750 when they were converted to provide flintstone for the pottery industry at Swinton and Mexborough. They had closed by c. 1880 and were soon demolished. Water for these mills was originally provided by the weir across the river. This was raised in height when the lock at Conisbrough was demolished.

The Ferryboat Inn had 9 cottages next to it. The nearby Queen's ferry, which was illustrated in an engraving done in 1702, was a chain ferry upstream of the weir.

The hamlet of Levitt Hagg had 23 cottages with a population of about 100 who were involved in working the adjacent quarry and limekilns. Because of the later use of the site as a quarry waste disposal area there is virtually nothing left except for some kilns.

Sprotborough Flash was leased from the British Waterways Board in 1981 but has now been secured from them as a nature reserve owned by the Yorkshire Wildlife Trust. Cormorants have been recorded there since 1983 and there have been two sightings of Little Egret. The Trans Pennine Trail runs alongside the river but needs to be better maintained as it can be a quagmire in wet weather as a combination of motorbikes and fishermen's trolleys churn it up.

Farcliff Flash and Ings were created as a result of mining subsidence from Cadeby pit. The adjacent wood has Green Woodpecker, Woodcock, Green Hellebore, Early Purple and Bee Orchids, Speckled Wood and Marbled White butterflies and Grass Snakes.

Cadeby Quarry has permission to quarry until 2060 and to extend as far as Nursery Lane. Pot Ridings Wood is potentially under threat although the quarry ownership keeps changing. The railway line through the wood which ran between Barnsley and Hull was opened in 1897 and closed in 1968. The quarry was landscaped in the 1980s and looks very different from earlier times. Cadeby Wharf is still used to take some of the stone away by river.

Conisbrough Viaduct was opened in 1909. It has 21 arches and is 1527ft long. Conisbrough blue bricks were specially made for it and some 1 million were used in its construction. There is a good view of the castle from the viaduct. The original castle would have been wooden but was replaced in stone by the Plantagenets.

Mr. Parkin concluded his talk with views of the Miners Bridge at Conisbrough station and Doncaster station. Throughout his talk he fielded a number of questions and comments from the audience.



The Wild Tulip *Tulipa sylvestris* in The Don Gorge

Colin A. Howes

*Three shapely leaves will first unfold,
Then, on a smooth, elastic stem,
The verdant bud shall turn to gold,
And open in a diadem.*

James Montgomery (1771-1854)
quoted in Henry Baines (1840)

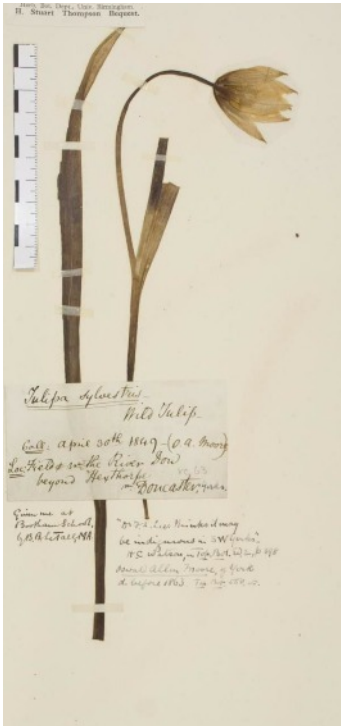


Figure 1: Specimen collected at the Doncaster site on 30 April 1849 by Oswald Allen Moore (Herbarium of Birmingham University)

Introduction

Henderson, Howes and Lambert (2010) Undertook a detailed survey of historical and current evidence of the Wild Tulip throughout Yorkshire. Their study also traced its origins in Persia and the history of its introduction into Northern Europe and Britain by the 1570s, into Yorkshire as a horticultural novelty by 1705 and as a naturalised plant here by at least 1831.

Clapham et al. (1962) describe *Tulipa sylvestris* as occurring in France, Italy, Sardinia, Sicily, the Balkans to Serbia and Bulgaria. To this range, Taylor (2002) includes N. Africa and S.W. Asia. It is naturalised in central and northern Europe and in the British Isles. Richard Mabey (1996) confirms that *T. sylvestris* “is a southern European species anciently introduced to Britain and naturalised in a few wooded gardens, meadows and parkland. Greatworth Manor in Oxfordshire, Ellen Wilmott’s old garden at Warley Place in Essex, and the site of ‘Petronella’s Hospital for Leprous Maidens’ in Bury St Edmunds are typical localities. The Wild Tulip produces a great many leaves but, even in cultivation, very few flowers”.

In reviewing the status and ecology of *T. sylvestris* in the UK, Taylor (2002) describes it as “A bulbous perennial herb of open woodlands, orchards, hedgerows, riversides, chalk pits, grassy banks and waste ground. Populations can arise from discarded

bulbs, deliberate planting in the wild or as relics of cultivation. Plants often flower poorly and set little seed, but populations can be very long-lived. It was formerly much cultivated, and was in cultivation in Britain by 1596 and recorded from the wild by 1790”.

The tulip appears to have been widely naturalised by the late 18th and 19th centuries but it had already declined dramatically by the time of the 1962 Atlas (Perring & Walters 1962). Stace (1991) regards it as rare but that it was formerly much more frequent.

The present study has sought to collate evidence of *T. sylvestris* by examining regional natural history journals, primarily *The Naturalist* and the *Northwestern Naturalist*, regional topographical literature of the 19th and early 20th centuries, annotated herbarium sheets in museum and university herbaria, contact with YNU and BSBI recorders and certain local natural history societies.

Wild Tulip in the Don Gorge

The earliest Yorkshire record is from the Doncaster botanist and nurseryman Samuel Appleby (1832) who in 1831 encountered it on low warp lands liable to be overflowed, immediately adjoining the river Don (Lees 1888). Henry Baines (1840) knew of it “In a field between Hexthorpe [SE/5501] and Sprotbro’ boat [SE/5301], on the banks of the river Don; covering a considerable space, but flowering only sparingly”.

A specimen collected on the Don Banks, Doncaster in 1846 by John Tatham was in the herbarium of William Whitwell (Lees 1888). Peter Inchbald (1848), referring to the Don Valley site notes the “leaves of the tulip [are] conspicuous in the grass fields early in the spring but by May [are] nearly hidden”. A specimen collected on 30 April 1849 by Oswald Allen Moore of York is in the collection of Harold Stuart Thompson in the Herbarium of the University of Birmingham (see Figure 1). Annotations on the herbarium sheet describe the find site as a field near the river Don beyond [presumably up stream of] Hexthorpe. The specimen was given to Thompson at Bootham School, York by the science master B.B.le Tall. *Tulipa* was “there still in 1869, but not flowering every year”. The general situation is described as an alluvial meadow (or meadows) between Hexthorpe and Sprotborough boat (Lees 1888). A specimen collected by F.G. [presumably a mis-transcription for F.A.] Lees ‘In a field at Sprotbrough 8 May 1871’ is in the British Herbarium of the Natural History Museum.

In his booklet, *Village Sketches*, C.W. Hatfield (1849), who obtained his botanical information from Samuel Appleby, wrote of this site “There are two large beds of this pretty ... plant by the river-side, each of which are very large, the quantity of bulbs they contain could not easily be calculated, perhaps many thousands, growing so closely together that they seldom bloom. A few small patches may be seen detached from these two large groups, having more soil and freedom of growth where flower stems sometimes spring up”.

Davis and Lees (1880) state that “In unbroken pasture and by the river grows the wild tulip (*T. sylvestris*) in some profusion and for a distance; rarely flowering, however, and perhaps not native, though it is difficult to say to what other category of citizenship it should be referred”. Baker (1907) notes “Below Conisbrough the Don enters the Magnesian Limestone and continues past Sprotborough and Hexthorpe ... Here the wild tulip *Tulipa sylvestris* grows in considerable quantity near the river”.

A.A. Dallman (1930) was aware that *Tulipa sylvestris* had been known here since 1831 and knew of the specimen collected here in 1846 by J. Tatham. He was also aware of C.W. Hatfield's account of the large population during the 1840s. During Dallman's residency in Doncaster he had "searched for the plant hereabouts for some years" without success and "was beginning to fear it might have become extinct". Then on 29 March 1930 he located "about a dozen plants but with no signs of bloom". By 5 May the foliage was dying back, still without signs of the plants having produced any flowers. Dallman (1930) described the site as being "in an alluvial situation on the margin of a wood and at about 40ft above sea level. *Gagea lutea*, *Doronicum pardalianches* and *Alium ursinum* also occur in the vicinity, the last two in some abundance". Dallman (1932) listed *Tulipa* as one of the botanical highlights of the Doncaster area in Circular 367 for the YNU Excursion to Doncaster 30 April 1932, though it does not appear to have been encountered on that occasion. In April 1935 Dallman located "upwards of 3000 leafy plants ... only two flowering examples were observed, one of which [he] photographed" (Dallman 1935, Sledge 1937). He visited again on 2 May 1936, describing the plants as "in some abundance and has every sign of being indigenous. There was no sign of flower on any of the several thousand plants here" (Dallman 1936).

Lesley Smith (pers. comm.), who knew Dallman through the Doncaster Naturalists' Society, visited the *Tulipa* site up to mid 1960s describing its location as "a riverside pasture on the Warmsworth/Hexthorpe (south) bank of the Don, upstream of where the current A1(M) road bridge spans the Don Gorge [SE/5401]". The plants were not seen after the bridge was constructed.

Shaded land immediately adjacent to the A1M flyover has been colonised by dense hawthorn scrub and former limestone pasture and river washland upstream has been developed as arable. However, the unimproved pasture adjacent to the Don Gorge woodland at Mill Lane contains a marshy, alluvial zone liable to seasonal flooding, a zone of sandy old river levee and to the rear, steep species-rich limestone grassland. Visits here at the appropriate time of year may again confirm the presence of *Tulipa*.

Elsewhere in South Yorkshire records its former occurrence have been tracked down to Sandbeck Park where it was photographed in cultivation in 1978, and herbarium specimens were collected from a meadow in the Tickhill area in 1931 and Wentworth Woodhouse in 1804 (see Henderson et al. 2010).

Acknowledgements

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The Flamingo Moss *Tortula cernua* on kiln-dried Magnesian Limestone fines in the quarries and kiln sites of the Don Gorge, Doncaster: a centenary review

Colin Howes, Colin Wall, Tim Kohler and Louise Hill

Introduction

The nationally rare Flamingo Moss *Tortula cernua* (Huebener) Lindb., formerly *Desmatodon cernuus* (Hueb.), has a scattered distribution across northern and central Asia, North America and Europe. It is a circumpolar species, extending to the high arctic in Spitsbergen, Ellsmere Island, and northern Greenland. Its southern distribution extends to high altitude sites in mountainous regions of Central Asia, New Mexico, Northern, Central and Eastern Europe (Blockeel 1992).

In Britain it has only ever been found in a small number of locations confined to nine 10 kilometre squares (Fig.1). Apart from one ex-coliery site in Cheshire and a site on Millstone Grit moorland in Pennine South Yorkshire, all other sites are confined to a series of quarry and lime kiln sites in the Southern Magnesian Limestone Natural area from West Yorkshire, South Yorkshire and Nottinghamshire (Blockeel 1992). By far the largest populations of Flamingo Moss in the UK are within the Don Gorge, the largest concentration being at the foot of the crags in what remains of the now land-filled Levitt Hagg Quarry (SE/5300).

In the Don Gorge sites the Flamingo Moss is strongly associated with lime kiln waste. The substratum is alkaline (pH >8.9) and contains very low concentrations of major plant nutrients as well as an imbalance of calcium and magnesium which are all inimical to the growth of larger vascular plants (Headley 2005).

Conservation status



Flamingo Moss growing on limestone fines.
L.Hill



Flamingo moss - note its beak-like capsule. *L.Hill*

The results of the most recent surveys suggests that Flamingo Moss is now restricted in the British Isles to seven sites in South Yorkshire and one on the Notts/Derbyshire border (Nick Hodgetts pers. comm.). Due to its extremely restricted distribution in Britain and the highly specialist nature of its preferred substrate here, Flamingo Moss has been classified as a Red Data Book category 1 (Endangered) species (Church et al. 2001). Even across Europe its status is classified as RDB 2 (Vulnerable). In consequence of this, the UK Government's Biodiversity Steering Group placed it on the short list of Globally Threatened or Declining species (UK Biodiversity Group 1995). It consequently features as a UK priority species in the 'Biodiversity Audit of Yorkshire and the Humber (Selman et al. 1999). In April 1998, statutory instrument no. 878 added Flamingo Moss to Schedule 8 of the Wildlife and Countryside Act 1981, granting it protection from intentional destruction.

History of its discovery in Yorkshire

Flamingo Moss was first discovered in Britain by the York bryologist George Webster who located a small patch on the Magnesian Limestone near Aberford (SE/43) West Yorkshire at the end of September 1900 (Hobkirk, 1901). The JNCC records show that the moss was subsequently encountered at this site on 3 November 1900 and November 1901 by George Webster, on 5 August and 5 September 1915 by W. H. Burrell, 10 November 1923 by C. A. Cheetham, August 1929 by D. A. Jones and 16 October 1929 by W. H. Burrell. JNCC records also show that it was encountered at nearby Barwick in Elmet (SE/43) on 17 November 1900.

On 1st May 1909 Mr T. C. Thrupp of Doncaster collected specimens in good condition at a site in the Don Gorge by the river Don described variously as being 'between Doncaster and Conisbrough' (Ingram 1909) and 'near Conisbrough' (Cheetham 1910). The specimens were identified by Mr William Ingram, and was judged to be better established here than at Aberford where it was believed to be scarce (Ingram 1909, Cheetham 1910).

On 1st November 1913, during a meeting of the Bryological section of the Yorkshire Naturalists' Union, Flamingo Moss was again located in limestone crags by the Don (Cheetham 1913) and in 1919 it was again confirmed to be flourishing at its 'Conisbrough site' (Burrell 1920). The habitual though misleading reference to the site being at Conisbrough was probably due to visiting naturalists arriving in the area via Conisbrough Railway station. References to the site being at or near Sprotbrough, the nearby village further down stream and on the north bank of the river, was also erroneous and misleading.

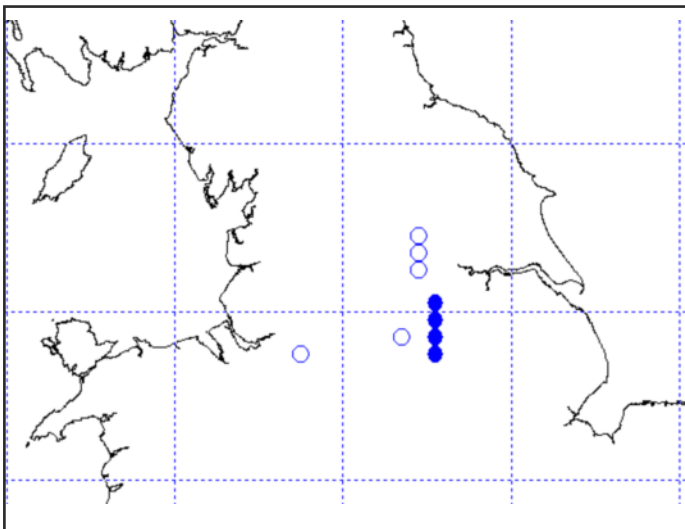


Figure 1 - British distribution of *Tortula cernua* (From Hodgetts 2006)

Open circles: pre-1980. Closed circles: 1980-2005

In fact, local naturalists knew the site to be lime kilns and quarries at the now extinct quarrying and barge-building village of Levitt Hagg (SE/5300) on the south bank of the river at the Warmsworth end of the Gorge. The first specific reference the Levitt Hagg related to a specimen collected on 26 February 1921 by the celebrated South Yorkshire botanist John Henry Payne (Herb. Donc. Mus.).

In 1929 it continued to be well established at its site 'near Sprotbrough' (Rowlands 1929). On 22nd May 1965 the YNU Bryological section again visited the site where Mr G.A. Shaw's re-discovery of Flamingo Moss (Hubn.) was deemed to be 'the star discovery of the day' (Branson 1965).

During the YNU excursion to Sprotborough on 13 June 1987, Levitt Hagg which 'has a high reputation among Yorkshire Bryologists' was visited and a search 'over the powdered limestone tracks in the quarry complex produced old Desmatodan capsules' (Wall 1988). During the visit of the British Bryological Society to the Don Gorge in September 1991, Messrs Tom Blockeel and Colin Wall showed Dr Nick Hodgetts (JNCC Lower Plants Specialist) an area of Flamingo Moss growing in a discrete 'arm' of the main Levitt Hagg quarry (Hogett 1991).

Other sites on the Magnesian Limestone in Yorkshire

West Yorkshire VC64 JNCC records show that it was recorded at Garforth (SE/43) in February 1918 by W. H. Burrell and C. A. Cheetham and in April 1933 by W. H. Burrell and F. E. Milsom. It was also noted at Parlington (SE/43) on 13 September 1918. It was noted by the YNU at Fairburn (SE/42) on 16 June 1934 and at Newton Quarry (SE/42) in June 1934 by W. H. Burrell. Newthorpe Quarry (SE/43) was a new site located on 27 June 1937 by W. H. Burrell and F. E. Milsom, and finally on 29 November 1948 it was recorded at Smaws Quarry (SE/44) by E. C. Wallace.

South Yorkshire VC63 It was located at Lindrick Common (SK/58) on 29 January 1947 (JNCC records) at Roche Abbey (SK/58) and Maltby in 1970 by T. L. Blockeel and at South Anston (SK/58) in 1979 also by T. L. Blockeel (JNCC records and T. L. Blockeel in litt.).

Non-limestone sites in Yorkshire

In 1980 it was located at Bell Hagg, Rivelin (SK/38) by A. J. E. Smith and T. L. Blockeel (JNCC records).

Other *Tortula cernua* sites in Britain

Nottinghamshire VC56 It was first noticed in Steetley Wood (SK/57) in August and subsequently at Woodend, Shireoaks (SK/58) by J. Brown on 1 September 1946 (JNCC record) and was again located at Shireoaks in 1956 (T.L. Blockeel in litt.).

Cheshire VC58 It was located at Plumley lime beds SJ/7075 on 23 September 1966 (Brit. Bryol. Soc./JNCC records).

Destruction of Doncaster's Levitt Hagg site

The disused Levitt Hagg Quarry complex had long been recognised as being of particular ecological and geological interest and was consequently designated as a County and Metropolitan Borough Council (second tier) 'Site of Scientific Interest' (SYCC 1980, DMBC 1988 a & b, 1989). The surrounding woodlands formed part of the Sprotborough Gorge SSSI and the YNU Bryological Section specifically drew the attention of the Planning Authority to the occurrence and significance of Flamingo Moss in site. However, on the balance of local needs the decision was made in 1992 by Doncaster Metropolitan Council Environmental Services Directorate to embark on a proposal, formerly devised by the Environment Department of the South Yorkshire County Council, to acquire the Levitt Hagg site and areas of adjacent woodland for land-fill purposes. This decision precipitated a detailed survey of Flamingo Moss distribution within the proposed land-fill area with a view to developing strategies to translocate the moss together with its preferred substrate.

On the evening of 14 September 1992 the CH of Doncaster Museum and CW of the YNU Bryology Section visited Levitt Hagg Quarries with a view to instigating a distribution and status survey. Observations were also made on habitat and substrate requirements of the moss colonies in order to consider possibilities for on site conservation management or if necessary, for translocation.

Ten near-monoculture colonies of the moss were located, nine of which were situated in areas destined for re-engineering to lower the quarry floor and were on a substrate which was to be used to form the core of the land-fills outer retaining bund.

Preferred substrate and habitat

G. A. Shaw and F. E. Branson found the species 'growing on powdery limestone at the edge of one of the quarries' (Branson 1965). Nick Hodgetts, Tom Blockeel and Colin Wall, who in September 1991 examined the colony on the [Doncaster to Sheffield] railway embankment to the rear of the Levitt Hagg site, described it as 'growing in local abundance on steep, damp, very unstable limey soil' (Hodgetts 1991).

Searches on 14 September 1992 by CH and CW, revealed its occurrence to be tightly restricted to mounds and deposits of talc-like limestone fines, ten of which had been colonised within the Levitt Hagg quarry complex, the largest concentration being on the steep north facing railway embankment adjacent to tramway tunnel no.-- on the western side of the quarry.

On 16 September 1992 CH conducted Mr Graham Blount, manager of the adjacent Pilkington's (Warmsworth) Quarry and previous owners of the Levitt Hagg site to each of the Flamingo Moss colonies with a view to identifying the origins of the preferred substrate. He was able to confirm the material, known in the lime products industry as flu-dust, as a by-product of the dolomite crushing and drying process. This fine talc-like powder had undergone heating (but not burning) during the process to drive off over 90% of the moisture content of the pulverised rock. Periodically the dust extraction mechanisms in the processing plant were cleaned out and in the past, the debris was routinely dumped in layers or mounds, indeed substantially in-filling sections of the bed of the disused Levitt Hagg Quarry system.

Since this form of waste production and dumping had not taken place within Mr Blount's eleven year career at the quarry, the substrate being utilised by Flamingo Moss had been weathering down for at least his period and indeed probably since the 1950s when the Levitt Hagg quarry was abandoned. Most had remained un-colonised by either vascular plants and most mosses.

In 1992 samples of the Flamingo Moss growing substrate from the railway embankment site were forwarded to the Unit of Comparative Plant Ecology at Sheffield University where analysis by Dr Alan Baker indicated no evidence of contamination by heavy metals and that the samples were consistent with those collected from uncontaminated highly calcareous skeletal soils (Grimes 1992).

Alistair Headley (2004, 2005) confirmed that the moss indeed grows in unusually highly alkaline material, which in the Doncaster areas is derived from some form of lime kiln waste produced from the processing of Magnesian limestone. As a consequence of the alkaline nature of the substratum (pH is typically between 8.5 and 9.2) the vast majority of phosphate in the substratum is not available to plants, including mosses. This explains the infertility of the wastes and the poor growth of flowering plants. The concentrations of other major plant nutrients (nitrogen and potassium) are generally low, but the high concentrations of magnesium relative to calcium will make it difficult for higher plants to take up potassium and will therefore add to the infertility of the substratum.

Flamingo Moss appeared to thrive best on the shaded sides of aged, well weathered, darkening, often steep sided heaps of substrate with a greasy surface texture. Preferred sites had been kept slightly damp by light shading but were not completely over-shadowed by regenerating trees or shrubs, mainly of *Acer pseudoplatanus*, *Betula pendula* and *pubescens*, *Fraxinus excelsior* and *Salix cinerea*.

Generally the species-rich flora of vascular plants, which thrived on the more mature limestone rubble soils of the old quarry floor, posed no competitive threat to Flamingo Moss since none were capable of colonising the evidently inhospitable powdered fines substrate. Climbing or scrambling species such as bramble *Rubus fruticosus* agg. were however capable of growing across the substrate without actually rooting into it. In the case of the railway embankment colony, this behaviour was beginning to shade out Flamingo Moss and threatened to become a problem in future years.

Headley (2004, 2005) showed that Flamingo Moss is not restricted to materials with a particular particle size distribution and there is no consistency as to how slowly the sites would dry out. Due to the aspect and cover of surrounding trees and shrubs some locations are less likely to be desiccated than others, whilst others are more prone to rapid drying out due to the nature of the substratum or exposure to direct sunlight.

Associated Bryophyte species

G. A. Shaw and F. E. Branson found that on their visit in 1965, Flamingo Moss was growing in association with the small bryoid moss *Leptobryum pyriforme* (Branson 1965). Hodgetts (1991) and C. Wall in 1992 also found it in association with *L. pyriforme* together with *Funaria hygrometrica*, *Dicranella varia* and *Aneura pinguis*. T. L. Blockeel (in litt.13.10.1992) also notes the nationally rare and decreasing *Aloina rigida* recorded here in 1955, which like Flamingo Moss is a species of open calcareous habitats.

'Rescue' translocation

Although fleets of contractors bulldozers, diggers, lorries, and other earth moving machinery had arrived on site, through the good offices of Mr T. Kohler (English Nature), A. Doyle (DMBC Minerals Planning Officer) and A. Windust (DMBC Waste Disposal Manager), progress with the re-engineering of the quarry floor and the building of the outer retaining bund was delayed till the translocation of the moss colonies had been achieved.

A potentially suitable translocation site had been identified on the west side of the site which although outside the operational area of the proposed landfill, was within the ownership of the DMBC. A large and venerable mound of substrate had also been identified for transfer to this plot to form the receptor substrate for the translocated 'turves' of moss.

In lifting the substrate by JCB digger into a Volvo tipper truck, the four metre high mound of mature consolidated flu-dust fines, which had been stable for decades, unexpectedly revealed its thixotropic qualities and converted into a treacherous porridge-like consistency. A truck load of this now semi-liquid material was deposited onto the allocated translocation site.

Following an abortive experimental attempt to lift and translocate large sections of substrate complete with in-tact moss colonies with a JCB digger, greater success was achieved with the use of sharp bladed spades with which to carefully skim off and lift the samples by hand. A large piece of plywood found on site was opportunistically used to transport these 'turves' and carefully place them on the translocation zone.

CH, together with a team of trainees and their instructor, Mr I. Thompson, from the Bently Training Centre removed series of moss colonies ranging in size from 50 cm to 1 metre square and with a minimum substrate depth of 50mm from the nine Flamingo Moss populations on the quarry floor and placed them onto the translocation zone.

Monitoring

In September 1993 sites within the Don Gorge and elsewhere, where lime waste substrates and herb-rich limestone turf from Levitt Hagg had been translocated were examined for evidence of Flamingo Moss colonisation.

Due to the thixotropic behaviour of the flu-dust material, the nature and form of the translocation site was far from satisfactory, however, the site has been inspected annually in either November or January by CH and signs of Flamingo Moss have been present on each occasion (1993 to 1999).

In 1979 T. Blockeel located Flamingo Moss on the Steetleys Ltd. limestone waste tip on the north bank of the Don Gorge adjacent to Cadeby railway viaduct (SE/526994). Colin Wall also located it at the foot of the tip in 1988. The tip, classified as a 'derelict industrial site' was subsequently removed by the local Authority with the use of a Department of the Environment 'Derelict Land Grant' and translocated into a disused limestone quarry adjacent to Nursery Lane, Sprotborough (SE/532014) and grassed over. The site of the lime-waste tip was also top-soiled and grassed over. Fortunately sections of the underlying tip material remained exposed for several years and in 1993 and 1994 an ephemeral colonisation of Flamingo Moss persisted until ruderal and rank grassland vegetation finally took over.

In 1992, turves of herb-rich vegetation from Levitt Hagg quarry floor were mechanically translocated into the disused limestone quarry to the rear of the itinerant site on the north side of Nursery Lane, Sprotbrough (SE/533015). CH inspected these in 1993 and 1994 and colonisation by Flamingo Moss was noticed on adjacent areas of exposed limestone fines. These have subsequently vegetated over with vascular plants.

Also in 1992, turves from the same source were translocated onto a substrate of fine magnesian limestone hardcore placed in the spaces left by lifted concrete flagstones in the inner courtyard at Doncaster Museum (SE/579030). Again for at least two years patches of Flamingo Moss grew in a shaded and damp area until overwhelmed by self set ferns.

Levitt Hagg (trackside) SE534004 There appears to be very little gross change at this site compared with 2004, except that a large branch has fallen near Quadrat 1. However, there are some changes in the distribution of *T. cernua*, which is still abundant and producing sporophytes copiously. As before, *T. cernua* is abundant in the lower right part of the slope in the main area and more scattered to the lower left. However, it has increased on the upper slope, where there are now some substantial patches of fertile material. *T. cernua* grows mostly in small tufts mixed with the much more extensive *Didymodon tophaceus*. An estimated 10,000 sporophytes occur here, so the total population is perhaps rather less than in previous years. The steep slope is now apparently less used by trail-bikers, with tracks much less prominent.

Levitt Hagg (tunnel) SE536007 Again, this site superficially looks more or less the same as in 2004, but closer examination revealed significant changes, with a great increase in fertile material on the steep open slope where Quadrat 2 is positioned. The brickwork of the tunnel now supports only scattered and moribund shoots, with ca. 50 sporophytes counted. The bryophytes here look desiccated and shrivelled, and vandals have sprayed the brickwork with blue paint, which has presumably not been beneficial to *T. cernua*. *Leiocolea badensis* (with perianths) is still abundant in places, particularly on the spoil heap immediately below Quadrat 1. A new colony of *T. cernua* was discovered on a patch of bare ground above the tunnel entrance, with ca. 1000 sporophytes.

Levitt Hagg (cliff) SE538010 This site looks almost identical to last year, with a large open expanse of wet soil colonised by bryophytes. There appears to have been little or no disturbance since 2004. The soil is mostly consolidating somewhat. Sterile shoots of *T. cernua* are still abundant amongst the even more abundant *Didymodon tophaceus*, but remarkably sporophytes are almost absent, except for in a small area in the 'bay' of the cliff, where there are perhaps in the region of 10,000 sporophytes.

Conisbrough, Nearcliff SK526993 The hummock with *T. cernua* looks more or less the same as last year, and *T. cernua* is distributed in about the same way as in 2004. However, vascular plants and in particular mosses such as *Calliergonella cuspidata*, *D. tophaceus*, *Funaria hygrometrica*, *Dicranella varia* and *Leiocolea badensis* have to some extent encroached downwards from the top. In total there are still many (probably ca. 1000) sterile

shoots, and about ca. 200 shoots with sporophytes. Significantly, four sporophytes and several sterile shoots were for the first time found on the other side of the path from the hummock. No further *T. cernua* was found elsewhere on the site. The formerly bare stony area nearby has become significantly more vegetated, and looks even less likely than before to support *T. cernua*.

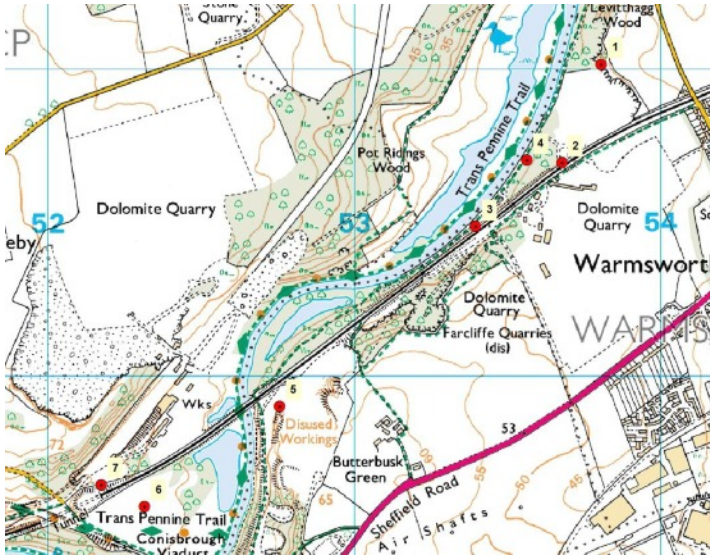
Conisbrough Viaduct SK523994 The vegetation at the side of the track has continued to creep forwards, with the grass verge extending over the original track margins and substantial quantities of dead leaves (mainly hawthorn) on the ground, from the hedgerow. The soil of the track itself has become more compacted through the passage of pedestrians, with substantial areas where it has become very churned up from trail bikes. The central gully is bigger than last year, due to erosion. A mattress has been burned at the junction of the main track and the subsidiary track, resulting in some damage to the ground and bordering vegetation. *T. cernua* has apparently fared very badly this year, and very little was found.

Table 1: Summary of *T. cernua* population over six years (from Hodgetts 2006)

Site	Population estimates					
	2000	2001	2002	2003	2004	2005
Levitt Hagg (tunnel) SE536007	>500,000 shoots	-	>10,000 fertile shoots	>10,000 fertile shoots	ca. 2,000 fertile shoots	>5,000 fertile shoots
Levitt Hagg (trackside) SE534004	>200,000 shoots		ca. 20-25,000 fertile shoots	ca. 20-25,000 fertile shoots	ca. 20-25,000 fertile shoots	>10,000 fertile shoots
Levitt Hagg (cliff) SE538010					ca. 800,000 fertile shoots; ca. 4,000,000 sterile shoots	ca. 10,000 fertile shoots; ca. 4,000,000 sterile shoots
Conisbrough Viaduct SK523994	> 150 fruiting plants		ca. 2000 fertile shoots	a. 2000 fertile shoots	ca. 3500 fertile shoots	3 fertile shoots; scattered sterile shoots
Conisbrough, Nearcliff SK526993		ca. 100 fertile plants		ca. 50 fertile shoots	a. 300 fertile shoots; ca. 1000 sterile shoots	ca. 200 fertile shoots; ca. 1000 sterile shoots

Flamingo Moss *Tortula cernua* at Sprotbrough Gorge – Site visit 14/10/2011 (Kohler 2011)

On 14 October 2011 a site visit organized by Tim Kohler was undertaken by Colin Wall, Colin Howes, Tim Kohler, Rosy Key, John Holdsworth and John Creedy to re-examine the known locations for Flamingo Moss in the gorge, and look at some additional areas where colonies might be present. The sites examined are located on the map below.



Map showing Flamingo Moss sites in the Don Gorge (red circles)

Site 1 – SE 538009 Previously recorded site. An area of mostly bare substrate against cliff face within the former Levitt Hagg Quarry, now part of the cap on tipped waste. This area was not topsoiled, and material from the quarry used to cap the surface of the tip. An extensive colony of Flamingo Moss had previously been found here. On careful examination numerous small areas of moss were found, most densely close to the cliff face, where the substrate dipped down to the cliff. The moss was growing in small pockets and depressions on the surface of the substrate. The more open area away from the cliff did hold small areas of moss, especially in little runnels or more sheltered pockets on the surface. The examples seen were all small, and could have been suffering from drought stress, the more numerous areas close to the cliff being the most sheltered. Colony widespread and healthy. Very little competing vegetation, with only very sparse *Festuca* and *Agrostis*, but more extensive moss cover.

Site 2 – SE 537007 Previously recorded site. A steep railway embankment close to one of the many tunnels passing under the railway. Scattered clumps of Flamingo Moss found mainly on a very steep section of the bank which showed some evidence of continuing erosion/slippage. Site completely (albeit lightly) shaded by ash and sycamore, mostly young (10-30 years), with significant leaf fall, although this is not covering the surface completely due to the steepness of the bank. Close to this site a number of mounds had Flamingo

Moss translocated onto them at the time of the landfilling of the adjacent Levitt Hagg quarry. These mounds are now totally overgrown, predominantly with ivy, and appear unsuitable, a brief examination failing to identify any patches of the moss.

Site 3 – SE 534005 Previously recorded site. A steep eroding bank adjacent to the track. Extensive patches of Flamingo Moss found along the base of the slope and on the bank.

Site 4 – SE 536007 Not previously recorded. Several small patches of moss were located on small slippage/erosion features alongside the track between sites 2 and 3.

Site 5 – SK 527999 Not previously recorded. Large area of limestone waste, but not as fine or processed as the previous sites. No Flamingo Moss recorded.

Site 6 – SK 523996 Previously recorded site. Area of former limestone waste tip, now restored. Flamingo Moss had been recorded from this area immediately following the restoration, but despite careful examination of a few likely spots no Flamingo Moss found. Most of the surface showed signs of organic matter incorporated into the substrate, with no areas of clear limestone waste observed.

Site 7 – SK 522996 Previously recorded site. This site located by Louise Hill in 2010, but not visited on this occasion. From photos/description, very similar to the other recorded locations on a steep eroding bank of fine limestone waste, the photos showing ash/sycamore cover similar to site 2.

Overall despite the very dry year a good population of Flamingo Moss was seen in the gorge. The small patches seen at new sites along the track suggest that it is capable of establishing wherever there is the appropriate substrate, and is still colonising new sites as they become available. The required substrate for the moss is a very fine processed limestone waste, all the examples seen being on this substrate. Other similar sites examined, but with slightly different substrates, did not appear to hold moss colonies.

The existing known sites (except 6) all still held healthy populations, with the Levitt Hagg site being the most extensive. The loss of site 6 some time in the last 10 years, and the gradually increasing canopy at site 2 (and possibly at site 7) suggests that to maintain the population some management work is required, as noted in previous studies.

Acknowledgements

It is appropriate that the compilation of this review coincided with the centenary of Doncaster Bryologist T.C. Thrupp's discovery of Flamingo Moss in 1909 in the Don Gorge, a region which has turned out to be its UK headquarters.

For assistance with field work and field identification, access to modern literature and for commenting on earlier drafts of this report, sincere thanks are due Tom Blockeel of the Yorkshire Naturalists' Union Bryological Section. Tim Kohler and Erica Donnison of English Nature and Arthur Doyle DMBC Minerals Planning Officer for sympathetic support throughout and Ian Thompson and his trainee 'Countryside Rangers' from the Bentley

Training Centre who helped with the Flamingo Moss translocation exercise in 1992. Special thanks are due to Dr Nick Hodgetts and Dr Jenny Duckworth (Plantlife) for copies of surveys and reports up to 2006 commissioned by Plantlife International and Natural England.

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Common Cottongrass in the Don Gorge at Cadeby Quarry

Ian McDonald and Colin A. Howes

Some years ago one of us (IM) encountered a patch of Cotton Grass in a regenerating marshy area in a disused area of the quarry bottom in the huge Magnesian Limestone Quarry in the Don Gorge at Cadeby (SE/519000).

The prospect of it being the normally acid-loving Common Cottongrass *E. angustifolium*, more typical of the peat bogs of the Pennines or Thorne and Hatfield moors, thriving on an intensely calcareous mineral substrate represented a curious ecological conundrum. Conversely, if it turned out to be the Broad-leaved Cottongrass *E. latifolia*, which is more typical of calcareous situations, then it would represent a new species for the Doncaster area.

Incongruous though this record seemed to be, an old record shows that there is a history of the genus occurring in the Don Gorge. Back in 1831, the Rotherham botanist and solicitor Mr George Pearson Nicholson published a list of plants in a journal called the 'Wath Repository'. Included in the listings was Cotton Grass 'in a bog near Conisbrough Castle'.

Through the kind permission of the quarry manager (Mr Roger Fox), the authors re-visited the site between two spectacular thundery downpours at lunchtime on 7 August 2001. We were most impressed with the natural habitat regeneration, where it would appear that all the right species were migrating in and establishing themselves on the 'raw' limestone scree, rock-falls and ponded areas, seemingly without any expensive artificial assistance.

The site of the original find was re-located and two areas of cotton grass were found, one about a metre square the other about one by four metres. Both were on the shore lines of highly calcareous ponds with Reedmace *Typha latifolia*, Common Reed *Phragmites australis*, Hard Rush *Juncus inflexus*, Jointed Rush *J. articulatus*, Grey Clubrush *Scirpus tabernaemontani* and Common Spike-rush *Elocharis palustris*. In deeper water was one of the broad-leaved Potamogetons and a layer of stonewort (*Chara* sp.). On the edge was *Juncus inflexus*, *J. articulatus*, Glaucous Sedge *Carex flacca* and various Sallows. It was also good to note the presence of young amphibians such as Smooth Newt, Common Frog and Common Toad which had clearly bred in the marshy area.

Samples of the cottongrass were collected and sent for critical identification to Don Grant who confirmed it as *Eriophorum angustifolium*. So no new species then, but an ecological curiosity which helps to confirm George Nicholson's record of 1831.

Acknowledgements

Thanks are due to Mr. Roger Fox, (Quarry Manager) OMYA Cadeby Quarry for permission to visit the site, also to Don Grant (YNU VC63 plant recorder) for confirming the identification of the cottongrass.

Dane's blood on Cadeby Viaduct!

Colin A. Howes

To any walker or cyclist familiar with the Trans Pennine Trail and the well used network of footpaths/cycle-ways through the Don Gorge, the Conisbrough Viaduct, recently surfaced by Sustrans, provides an invaluable link between the Don's wooded and picturesque north and south banks. To aficionados of Railway History and Industrial Archaeology, the viaduct (complete with its graffiti) represents an icon of South Yorkshire's railway and coal mining heritage. However, in the mid 1980s, in response to local appeals to remove what were considered by some to be industrial eyesores, the DMBC was obliged to investigate the costs and logistics of removing this structure from the landscape. As part of the planning consultation a letter entitled 'Dane's Blood on Cadeby Viaduct', drew attention to the presence on the structure of one of South Yorkshire's few colonies of Dwarf Elder or Dane's Elder *Sambucus ebulus*.

The railway viaduct, built by Henry Lovatt Ltd in 1906-7 and was opened for rail (mineral) traffic on 17 March 1909. The Dane's Elder was first discovered here twelve years later during a field excursion by the Mexborough Secondary School Scientific Society run by Arthur A. Dallman, Science Master at the school. The occurrence reported by Dallman (1921) notes that "the plant was growing in abundance on the embankment at the north-western end of the Dearne Valley Railway Viaduct over the Don, below Conisbrough." It was "well established, forming two extensive thickets. It doubtless owes its introduction here to the construction of the railway."

My first encounters with the plant at the Cadeby end of the viaduct embankment (disused since 1966) were during botanical 'square bashing' in the 1970s (13 August 1972, June 1974 and 26 January 1978) in company with Chris Devlin and Peter Skidmore of Doncaster Museum (happy days!). It has also been encountered during subsequent visits by the Doncaster Naturalists' Society.

In checking on its status on 11 September 2012 there were at least 95 flowering/fruitlet heads in two groups. Plants commenced shortly after the junction with the metalled TPT footpath/cycle-way (SK5214 9949) and extend for about 55m to within 10m of the commencement of the viaduct masonry. Doncaster naturalists have only ever known the colony at this site on the down-stream (northern) side of the old track-bed. Curiously, this copiously fruiting 'bird-sown' plant never seems to have spread further along the old embankment or even to the opposite side of the track-bed. However in November 1928, Henry Gilbert Payne, one of the sons of the botanist John Henry Payne of Newhill Hall, Wath-on-Deerne, discovered it in quantity on a farmstead at nearby Bolton-on-Deerne (Payne 1929).

An alien species, originating in southern Europe, it has a long history in Britain, becoming naturalised prior to 1500. It was known in the Tickhill area by the botanist Thomas Tofield of Wilsic in about 1785 (Skidmore et al. 1981) and the Sheffield botanist Jonathan Salt collected specimens 1 mile below Sheffield in 1888 (Lees 1888).

Richard Mabey (1996) noted that the cultural link with invading Danes was erroneous and based on a misinterpretation of the herbal name 'Danewort' which refers to the

plant's effectiveness in encouraging the 'danes' or diarrhoea ... so it wasn't Dane's blood on the Viaduct after all ... perhaps its effect made the trains run on time!

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Doncaster Naturalists Society Presidential Reports

AGM January 2012

The Society has had busy year, both with field work and outings, and through its contact with the Museum and Doncaster Council staff.

Field Visits outside our usual sphere: Holicarrs near Selby.

Joint meetings were held with:

- The Conchological Section of the YNU at Church Rein.
- The YNU botanical Section at Cadeby.
- The YNU Vice County meeting at Went Ings.
- Moth trapping group at Brockadale.
- The British Plant Gall Society at Thorpe Marsh.

We went in search of **long-lost species**:

- On a wild tulip hunt (which turned out to be wild goose chase!).
- Flushing out the true fox sedge at new sites in Fishlake.

We spread the word and **advertised the Society to the public** and industry:

- St Oswalds Church, Kirk Sandall - Bug Hunt.
- Moth-trapping at Stainton and Dunsville Quarries.

The Society kept in **contact with private landowners**:

- Scabba Wood survey visits.
- Cantley Hall Fungus Foray.

Long-running surveys were continued:

- Dawn Chorus at Sandall Beat Wood.
- Campsall and Norton Parish Profile.

Other events:

- Dorothy Bramley's 90th Birthday celebrations.
- Hosting the launch of the South Yorkshire Plant Atlas – over 70 people present.

Meeting with the Mayor to discuss the future of the Museum.
These were particularly successful and gained good publicity for the Society.

Other activities of the Society included:

- Publishing Part 2 of Volume 2 of the Doncaster Naturalist.
- Cataloguing the Environmental Records Archive at the Museum.
- Working towards providing a Volunteer Natural History Enquiries Service at Doncaster Museum.
- Representation on various outside organisations and groups.

Despite its size (membership remains just 40) the Society manages to have a high profile locally. Membership is steady but, as with most other societies, we struggle to attract younger members. This is despite an ‘apparent’ boom in the public’s interest in natural history.

Thank you to all committee members for their assistance throughout the year and to all members for supporting the Society.

AGM January 2013

Good News: The Pete Skidmore Appeal to buy the final piece of Hatfield Moors was successful. The DNS sponsored the Kora walk on the 7th July, Donated £1000 to the appeal and manned a stall at the Fete on the 1st Sept.

Doncaster Museum

Natural History Archives & Enquiry Service & Museum Natural History staffing - despite not being officially set up we have already assisted with two enquiries and enabled a researcher to use the natural history archive.

Working with other groups

- South Yorkshire Bat Group – Hibernation Surveys in Jan and Feb.
- YWT – Thorpe Marsh Nature Reserve Amphibian Hunt.
- English Heritage – Brodsworth Hall.
- Friends of Hyde Park Cemetery – visit to cemetery in May.
- Marshalls – Visits to Stainton Quarry and Dunsville Quarry – probably the last visit - we were greeted with the sad news that Ian Manley had been moved to another post within the company.
- British Plant Gall Society – Old Moor Wetlands.
- YNU Botany visit to Anston Stones Wood and Vice County meeting at Scammonden.
Thorne Moors Botanical Survey.

Regular Outings

- Dawn Chorus – Sandall Beat.
- Parish Profile – Bent the parish boundary to include Upton Country Park.
- Fungus foray - what a turn out! – (both of fungi and members).

Getting to new sites - Private landowners

- Ducker Holt – Bernard Russell.

Site visit to Lindholme Prison.
Pine Tree Farm, Sykehouse.
Fowdalls Lane meadows (owned by Doncaster Mayor P Davies).
Norton Priory Mill.

Venturing further afield

Bardney Limewood - nice place, nice butterflies – shame about the weather!

Future Programme

Lindholme Old Moor (Jack's Piece) - series of visits over the coming field season.
Bentley High Street Primary School – Bentley Environmental Centre (site of).

Representations made at various outside meetings

LAH /TJP Attended South Yorkshire Natural History Day - What's going on in S Yorkshire - 18th Feb.

PAS & LAH Attended Thorne and Hatfield Moors Conservation Forum Annual Meeting - 2nd March 2012.

Society was invited to DMBC Renewable Energy Workshop 15th March but had to decline. (No-one could attend).

Poster Display at YNU Conference in York (24th March).

LAH & PAS Doncaster Biological Records Centre Steering Group (29th March) Annual report available.

LAH Sent condolence card on behalf of the Society to the daughter and son-in-Law of Mrs Betty Morris - Scabba Wood.

LAH Attended Workshop for the Humberhead Levels Partnership (Value in Wetness II) representing DNS 22nd May

LAH attended 2nd Humberhead Levels Partnership Workshop Planned for 5th September

LAH and other Nats members DMBC Planning Consultation – housing and employment site Allocations Workshop - (12th September).

LAH, PAS, CH Meeting at Museum to discuss Environmental Archives - 24th September

LAH, MW Doncaster Biodiversity Action Partnership - 16th October

THig, LAH, CH, PAS, MS, PS and JS represented the Nats at the YNU AGM - 24th November

LAH, PAS, DMBC Local Site Partnership – SSIs - 18th December 2012

Publications

The Doncaster Naturalist - Part 3 is due out soon many thanks to Paul Simmons

Winter Programme

Indoor meetings at the Museum and Parklands are working well. Some very good turn-outs to say that we only have 38 members!

A remarkably active society for its size!



The Doncaster Naturalist is produced by the Doncaster Naturalists' Society on an occasional basis. This issue has been edited and designed by Paul Simmons, and printed by Process Print Solutions, Knottingley.

Doncaster Naturalists Society welcomes members who have interests in the natural history of Doncaster and district. It has served this function since 1880. The officers of the Society are:

President: Louise Hill

Secretary: Sheila Hill

Recorder: Pip Seccombe

The Society's website is: **www.doncasternaturalhistorysociety.co.uk**
and contact can be made via: **doncasternats@talktalk.net**

Events programme

The Society runs a very full programme of indoor and outdoor meetings. Forthcoming events can be seen at www.doncasternaturalhistorysociety.co.uk/events

All are welcome to attend.

Membership

The current membership fee is £7 per year. Contact the Secretary for details.

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Cover photo: A view from the Conisbrough Viaduct, showing Cadeby Quarry at the left and the Levitt Hagg landfill site at top right. *J.Simmons*

The drawing of Bird’s-foot Trefoil, used throughout, is by Elizabeth Farningham

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